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TECHNOLOGY ADMINISTRATION AUTHORIZATION ACT OF 1989

HEARING

BEFORE THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

ON

S. 1191

TO AUTHORIZE APPROPRIATIONS FOR THE DEPARTMENT OF COMMERCE'S TECHNOLOGY ADMINISTRATION TO SPEED THE DEVELOPMENT AND APPLICATION OF ECONOMICALLY STRATEGIC TECHNOLOGIES, AND FOR OTHER PURPOSES

JULY 25, 1989

Printed for the use of the
Committee on Commerce, Science, and Transportation

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TECHNOLOGY ADMINISTRATION AUTHORIZATION ACT OF 1989

TUESDAY, JULY 25, 1989

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, D.C.

The Committee met, pursuant to notice, at 9:36 a.m., in room SR-253, Russell Senate Office Building, Hon. Ernest F. Hollings (Chairman of the Committee) presiding.

Staff members assigned to this hearing: Pat Windham, professional staff member, and Fiona Branton, minority staff counsel.

OPENING STATEMENT BY THE CHAIRMAN

The CHAIRMAN. Good morning.

The Committee will please come to order.

Today we have our hearing on S. 1191, the proposed Technology Administration Authorization Act. It is important that we move forward on this bill. We have a practice within the Appropriations Committees, whereby the House requires that the authorization be enacted first.

So, for this endeavor to continue on course, an authorization should be reported out before we leave, if we can possibly do it before the August recess.

I yield to Senator Danforth.

OPENING STATEMENT BY SENATOR DANFORTH

Senator DANFORTH. Mr. Chairman, I don't have a statement, and also I am going to have to be leaving in just a few minutes because, unfortunately, the Finance Committee is having a markup this morning. So I will be in and out for this hearing.

It is a very interesting subject.

I think one question that I have is a recurring question: if the Federal Government is going to be spending money on science, what can we do to make sure that that money is not going to turn into just another pork barrel?

We have had this question arise with respect to research spending, particularly by the Defense Department. There has been a lot of comment and a lot of debate on the floor of the Senate about the earmarking of funds, particularly by the Appropriations Committee, for specific and very popular back-home research activities in universities.

Whatever we decide to spend—and I'm sure we're going to have some budget problems with the administration—but, whatever we decide to spend, how can we assure ourselves and the country that the money is going to be spent wisely and that it is not going to be simply another opportunity for us to score points with the folks back home?

The CHAIRMAN. I would only comment that the Reagan Administration had the same misgiving, along with many of us here on the Committee. I am confident that President Reagan would not have accepted and approved this initiative if it had been another pork barrel project. Under Secretary of Commerce Verity, the very first proposals were all submitted to the National Research Council, which reviewed them. Secretary Verity selected those selected by the National Research Council on a merit basis.

Senator Gore.

OPENING STATEMENT BY SENATOR GORE

Senator GORE. Thank you very much, Mr. Chairman.

I want to congratulate you for this initiative. I think it is greatly needed.

I hope, by the time the bill leaves the Committee, that I will be included as a co-sponsor.

I support most every provision of this bill, and I appreciate the Chairman's willingness to conduct a dialogue privately about one feature which I think could be modified. I hope that I can persuade the Committee of the merits of my position. This is that if a company conducts its research and development here in the United States, does all of its work here in the United States, and is nominally from a country that allows U.S. companies to participate in consortia that have government backing in that country, then, it seems to me the case is quite strong for some waiver provision to be used in a selective way, according to circumstances when very tough criteria are met to establish the definition of "domestic corporation."

Our objective is to create more jobs and a bigger technology base here in the United States, as well as improve U.S. competitiveness. Therefore, I think that this modification, when we get to markup, is something that I definitely am going to argue for.

Again, I appreciate the open minds I have encountered in making this case.

Finally, Mr. Chairman, I want to add a particular word of welcome. Like Senator Danforth, I will have to leave before these proceedings get very far along, and I apologize to all our witnesses for that. My departure does not mean that I am not very deeply interested and absorbed in this.

But I want particularly to welcome a personal friend, Morton Bahr, who will be our last witness today. I am delighted that he is going to be here.

Thank you very much, Mr. Chairman.

The CHAIRMAN. Thank you.
Senator Rockefeller.
Senator ROCKEFELLER. Mr. Chairman, I do not have a statement.
The CHAIRMAN. Very good.
[The bill follows:]

101ST CONGRESS
1ST SESSION

S. 1191

To authorize appropriations for the Department of Commerce's Technology Administration, to speed the development and application of economically strategic technologies, and for other purposes.

IN THE SENATE OF THE UNITED STATES

JUNE 15 (legislative day, JANUARY 3), 1989

Mr. HOLLINGS (for himself, Mr. BENTSEN, Mr. BRYAN, Mr. ROCKEFELLER, and Mr. BINGAMAN) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

---

A BILL

To authorize appropriations for the Department of Commerce's Technology Administration, to speed the development and application of economically strategic technologies, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Technology Administration Authorization Act of 1989".

STATEMENT OF POLICY

SEC. 2. Congress finds that in order to help United States industries to speed the development of new products and processes and in order to maintain the economic competi-

tiveness of the Nation, targeted increases are required in the programs and activities of the Department of Commerce's Technology Administration (hereafter in this Act referred to as the "Administration") and its National Institute of Standards and Technology (hereafter in this Act referred to as the "Institute").

TECHNOLOGY ADMINISTRATION

SEC. 3. There is authorized to be appropriated to the Secretary of Commerce (hereafter in this Act referred to as the "Secretary"), to carry out executive and analytical activities performed by the administration, $4,675,000 for fiscal year 1990, which shall be available for the following line items:

(1) Executive Direction, $1,013,000.

(2) Technology Policy and Commercial Affairs, $2,662,000.

(3) Japanese Technical Literature, $1,000,000.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

SEC. 4. (a) FINDING.—Congress finds that the Institute can assist United States industry in three ways to speed the commercialization of new products and processes: through the Institute's internal research and service programs, which provide industry with precise measurement and quality assurance techniques and with new generic manufacturing and process technologies; through its technology extension activities, which disseminate technical information and advanced

manufacturing techniques to a wide range of companies; and through its Advanced Technology Program, which can promote and assist industry's own efforts to develop new generic technologies.

(b) INTERNAL RESEARCH AND SERVICES.—There is authorized to be appropriated to the Secretary, to carry out the internal science and technology research and services activities of the Institute, $193,360,000 for fiscal year 1990, which shall be available for the following line items:

(1) Measurement Research and Standards, $50,185,000, of which $3,200,000 shall be available for chemical measurements and quality assurance and $2,500,000 for research on the automatic-level performance of electrical and optical systems.

(2) Materials Science and Engineering, $27,084,000, of which $3,600,000 shall be available to develop improved processing procedures for high-performance composites, and $2,000,000 for steel technology.

(3) Engineering Measurements and Standards, $69,428,000 of which $7,500,000 shall be available to develop measurement and quality assurance techniques for applications in advanced imaging electronics, including advanced television, $7,800,000 for research in superconductivity, $7,500,000 for lightwave and optoe-

lectronic technology, $2,500,000 for a new initiative in advanced semiconductors, $2,500,000 for a new initiative in automation research, $3,650,000 for the development of measurement and quality assurance techniques for bioprocess engineering, and $9,912,000 for fire and building research.

(4) Computer Science and Technology, $15,088,000, of which $7,500,000 shall be available for computer security activities pursuant to the Computer Security Act of 1987 (Public Law 100–235; 100 Stat. 1724).

(5) Research Support Activities, $34,575,000, of which $6,000,000 shall be available for improvements in computer support and $6,500,000 shall be available for the Cold Neutron Research Facility.

(c) INDUSTRIAL TECHNOLOGY EXTENSION ACTIVITIES.—In addition to the sums already authorized by statute to be appropriated for fiscal year 1990 for Research Centers for the Transfer of Manufacturing Technology and for assistance to State technology extension services, there is authorized to be appropriated to the Secretary to carry out the industrial technology extension activities of the Institute for fiscal year 1990, $4,000,000, of which $2,000,000 shall be available for the Technology Evaluation Program and

$2,000,000 shall be available for the Institute's management of its industrial technology extension activities.

(d) TRANSFERS.—(1) Funds may be transferred among the line items listed in subsection (b), so long as—

(A) the net funds transferred to or from any line item do not exceed 10 per centum of the amount authorized for that line item in such subsection; and

(B) the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives are notified in advance of any such transfer.

(2) The Secretary may propose transfers to or from any line item exceeding 10 per centum of the amount authorized for the line item in subsection (b), but such proposed transfer may not be made—

(A) unless a full explanation of any such proposed transfer and the reasons therefor are transmitted in writing to the Speaker of the House of Representatives, and the President of the Senate, and the appropriate authorizing committees of the House of Representatives and the Senate; and

(B) until the expiration of the thirty-day period following the transmission of such written explanation.

(e) OFFICE OF INDUSTRIAL TECHNOLOGY SERVICES.—Section 26 of the Act of March 3, 1901 (15 U.S.C. 278l), is amended by adding at the end the following new subsection:

"(c) There is established within the Institute an Office of Industrial Technology Services, which shall supervise the Centers program, the Institute's assistance to State technology programs, and such other activities or programs as the Secretary or Director may specify.".

ADVANCED TECHNOLOGY PROGRAM

SEC. 5. (a) FINDINGS AND STATEMENT OF POLICY.—Congress finds and declares the following:

(1) It is in the national interest for the Federal Government to encourage and, in selected cases, provide limited financial assistance to industry-led private sector efforts to increase research and development in economically critical areas of technology. Further, both joint research and development ventures (hereafter in this section referred to as "joint ventures") and selected research assistance to small firms are established and effective ways to create economically valuable new technology. Joint ventures are a particularly effective and appropriate way to pool resources to conduct research that no one company is likely to undertake but which will create new generic technologies that will

benefit an entire industry and the welfare of the Nation.

(2) In accordance with existing national policy, both the technology developed by any joint venture supported by the Department of Commerce as well as the resulting products should be made available, on a license and royalty basis and subject to the terms and conditions listed in this section, to nonparticipants.

(3) When a joint venture receives financial assistance from the Department of Commerce, the technology resulting from the joint venture should be licensed in such a way that the technology promotes the domestic manufacture of resulting products and components.

(b) ADVANCED ELECTRONICS, INCLUDING ADVANCED TELEVISION.—In addition to any sums otherwise authorized by this Act, appropriations to the Secretary and loan guarantees by the Secretary, pursuant to section 28 of the Act of March 3, 1901 (15 U.S.C. 278n), as amended by section 6 of this Act, and subject to the terms specified in subsections (d) and (e) of this section, are authorized at the following levels to assist one or more industry-led joint ventures in advanced electronics, including advanced television, to create and test the generic enabling technologies necessary to develop a United States industry to produce advanced electronic products, including advanced televisions:

(1) for fiscal year 1990, appropriations of $30,000,000 and, in addition, commitments to guarantee 90 per centum of the payment of the outstanding principal and interest on $50,000,000 in private loans;

(2) for fiscal year 1991, commitments to guarantee 90 per centum of the payment of the outstanding principal and interest on an additional $75,000,000 in private loans; and

(3) for fiscal year 1992, commitments to guarantee 90 per centum of the payment of the outstanding principal and interest on an additional $100,000,000 in private loans.

(c) OTHER INDUSTRY-LED RESEARCH PROJECTS.—In addition to the sums authorized under subsection (b) of this section and any other sums otherwise authorized by this Act, there is authorized to be appropriated to the Secretary, to carry out through the Director of the Institute further activities under section 28 of the Act of March 3, 1901 (15 U.S.C. 278n), $70,000,000 for fiscal year 1990, which shall be available for the following line items:

(1) Assistance to additional industry-led joint ventures, $58,000,000, which shall be available for the following categories:

(A) Applications of high-temperature superconducting materials, $15,000,000.

(B) Advanced manufacturing, $18,000,000.

(C) Semiconductor production equipment, specifically a synchrotron radiation project to assist the United States semiconductor industry to develop X-ray lithography as a method of producing semiconductor chips, $25,000,000.

(2) Assistance to United States small businesses which have held Small Business Innovation Research Program Phase I awards from other Federal agencies and which the Institute judges to have promising technologies in economically important technical fields, $10,000,000.

(3) Program management, analyses, and workshops, $2,000,000.

(d) GENERAL TERMS AND CONDITIONS FOR AID TO JOINT VENTURES.—Subsequent to any appropriation made pursuant to the authorizations in subsection (b) and subsection (c)(1) of this section, the Secretary shall invite requests for financial assistance from existing or proposed joint ventures in the designated technical areas. If requests are made, the Secretary, after an appropriate review of the technical and economic merits of each request, shall judge which individual requests or combination thereof, if any, merit assistance and shall decide what type and level of assistance each such meritorious proposal shall receive, except that in addi-

tion to the terms and conditions set forth in section 28 of the Act of March 3, 1901, as amended by section 6 of this Act, the Secretary shall make no award of any funds appropriated, or any loan guarantee, pursuant to an authorization contained in subsection (b) or subsection (c)(1) of this section unless and until—

(1) the joint venture is led by at least one North American company which operates in more than one State or region of the Nation;

(2) the joint venture demonstrates that it has raised, or has firm commitments for, private funds which exceed the level of Federal funds that the joint venture has requested from the Secretary and the fair market value of any loan guarantee commitments so requested;

(3) the joint venture has developed and submitted to the Secretary a business plan which, in the judgment of the Secretary, adequately—

(A) states a clear and focused research and development agenda, including the prototype products and production processes to be created and how that agenda complements a related research project or projects already being funded by Federal departments or agencies;

(B) provides assurance that the joint venture will have a sound management team;

(C) demonstrates that a party to the joint venture, acting on the joint venture's behalf, has filed a written notification with the Attorney General and the Federal Trade Commission, as required under section 6 of the National Cooperative Research Act of 1984 (15 U.S.C. 4305);

(D) provides, as appropriate, for participation in the joint venture by small businesses owned by United States citizens;

(E) considers metrology needs, and as appropriate, draws upon the technology, expertise, and facilities in the Institute's laboratories;

(F) sets forth provisions regarding the disposition of intellectual property resulting from the joint venture, including the rapid transfer of that intellectual property to members of the joint venture; the licensing, as appropriate, of the intellectual property to other North American companies and to foreign companies, in accordance with the provisions set forth in subsection (e) of this section; and, as appropriate, requirements for royalties which will return funds to the investors in the

joint venture, including the United States Government; and

(G) sets forth reporting and auditing procedures; and

(4) the Secretary, after an appropriate review of the business plan, judges that the proposed research and development agenda and the proposed management team have high technical merit.

(e) PARTICIPATION AND LICENSING BY FOREIGN COMPANIES AND NON-MEMBERS OF A JOINT VENTURE.—(1) In addition to the terms and conditions set forth in section 28 of the Act of March 3, 1901 (15 U.S.C. 278n), and subsection (d) of this section, the terms and conditions set forth in paragraphs (2) and (3) of this subsection also shall apply to any joint venture which receives any financial assistance from the Secretary pursuant to the authorizations provided in subsections (b) and (c)(1) of this section.

(2) No joint venture which contains a foreign company or a subsidiary thereof shall be eligible to receive financial assistance from the Secretary, and no foreign company shall participate in any joint venture which has received financial assistance from the Secretary.

(3) A joint venture which receives financial assistance from the Secretary may grant licenses to companies, including foreign companies, that are not members of the joint ven-

ture, for the use of intellectual property which the joint venture has developed, only if—

(A) licensing fees for the intellectual property are based on—

(i) the amount of research and development, product design, and manufacturing of products using the intellectual property that the company performs within the United States and Canada;

(ii) the percentage of domestically manufactured components, including electronic components, used in products which incorporate the intellectual property; and

(iii) in the case of a foreign company, the amount of reciprocal access North American companies have to that company's home market, as determined by the Secretary; and

(B) in the case of a foreign company, that company, in the judgment of the Secretary, has not within the past five years engaged in dumping practices within the United States or engaged in practices, either in the United States or abroad, which have the effect of infringing on or otherwise damaging the intellectual property rights of North American companies.

(4) The Secretary shall prescribe such rules and collect such information as may be necessary to monitor and enforce

any requirements set forth in paragraphs (2) and (3) of this subsection.

(f) DEFINITIONS.—As used in this section, the term—

(1) "foreign company" means a company or other business entity in which majority ownership or control is held by individuals who are not citizens of the United States or Canada.

(2) "North American company" means a company or other business entity in which majority ownership or control is held by individuals who are citizens of the United States, or citizens of Canada, or a combination of United States and Canadian citizens, except that such term includes a company owned or controlled by Canadian citizens only if, in the judgment of the Secretary, the company is not acting, with respect to the joint venture concerned, as an agent or intermediary for a third-country company or foreign government.

(g) COORDINATION.—(1) When reviewing private sector requests for Department of Commerce assistance to proposed joint ventures, and when monitoring the progress of assisted joint ventures, the Secretary shall, as appropriate, coordinate with the Secretary of Defense and other senior Federal officials to ensure cooperation and coordination in Federal technology programs and to avoid unnecessary duplication of effort. The Secretary is authorized to work with the

Secretary of Defense and other appropriate Federal officials to form interagency working groups or special project offices to coordinate Federal technology activities.

(2) As appropriate, the Secretary shall coordinate Advanced Technology Program policies and activities with the economic, trade, and security policies of the Department of Commerce so as to promote the economic competitiveness of United States industries and shall, when so instructed by the President, coordinate these policies with the science, technology, economic, trade, and security policies of other Federal departments and agencies.

(h) ADVICE AND REVIEW.—In order to analyze the need for and value of joint ventures in specific technical fields, to evaluate any joint ventures for which North American companies request the Secretary's assistance, or to monitor the progress of any joint venture which receives Federal funds or loan guarantees pursuant to the authorizations contained in this section, the Secretary, the Under Secretary of Commerce for Technology, and the Director of the Institute may—

(1) organize and seek advice from such industry advisory committees as they consider useful and appropriate;

(2) organize an Advanced Electronics Advisory Board for the purpose of developing a plan for research

and development in advanced electronics, including advanced television; and

(3) commission studies or reviews by the National Research Council.

AMENDMENTS TO ADVANCED TECHNOLOGY PROGRAM PROVISIONS

SEC. 6. (a) Subparagraph (B) of section 28(b)(1) of the Act of March 3, 1901 (15 U.S.C. 278n(b)(1)), is amended to read as follows:

"(B) participation in such joint ventures, if the Secretary, acting through the Director, determines participation to be appropriate, which may include (i) partial start-up funding, (ii) provision of a minority share of the cost of such joint ventures for up to five years, (iii) guarantees, and commitments to guarantee, for up to 90 per centum of the interest and unpaid principal of private loans to fund a minority share of such joint ventures for up to five years, and (iv) making available equipment, facilities, and personnel,".

(b) Section 28 of the Act of March 3, 1901 (15 U.S.C. 278n), is further amended—

(1) by redesignating subsection (e) as subsection (h); and

(2) by inserting immediately after subsection (d) the following new subsections:

"(e) The Secretary may provide no financial assistance, including loan guarantees, under subsection (b)(1) of this section except to the extent authorized by law and provided for in advance in appropriations Acts.

"(f) Any loan guarantees made by the Secretary pursuant to subsection (b)(1)(B) of this section shall, in addition to the requirements set forth in subsection (e) of this section, be subject to the following conditions:

"(1) Each loan guarantee shall be on such terms and conditions as the Secretary determines, except that a guarantee shall be made only if—

"(A) the loan bears interest at a rate not to exceed such annual percentage on the principal obligation outstanding as the head of the designated agency determines to be reasonable, taking into account the range of interest rates prevailing in the private sector for similar loans and risks by the United States;

"(B) the terms of the loan require full repayment over a period not to exceed thirty years, or the useful life of any physical asset to be financed by such loan, whichever is less (as determined by the Secretary);

"(C) in the judgment of the Secretary, the amount of the loan (when combined with amounts

available to the qualified borrower from other sources) will be sufficient to carry out the joint venture; and

"(D) in the judgment of the Secretary, there is reasonable assurance of repayment of the loan by the qualified borrower of the guaranteed indebtedness.

"(2) A loan guarantee shall not be terminated, canceled, or otherwise revoked, except in accordance with the terms thereof, and shall be conclusive evidence—

"(A) of the full compliance of that guarantee with the provisions of this Act; and

"(B) of the approval and legality of the principal amount, interest rate, and all other terms of the securities, obligations, or loans and of the guarantee.

"(3) The Terms and conditions of a loan guarantee shall provide that, if the Secretary makes a payment of principal or interest upon default by a borrower, the Secretary shall be subrogated to the rights of the recipient of such payment (and such subrogation shall be expressly set forth in the loan guarantee or related agreements).

"(g)(1) The Secretary may, for the purposes of managing the Program, employ at the Institute such technical and professional personnel and fix their compensation without regard to the provisions of title 5, United States Code, as the Secretary may deem necessary for the discharge of responsibilities under this section.

"(2) The Secretary may, under the authority provided by paragraph (1) of this subsection, appoint for a limited term or on a temporary basis, scientists, engineers, and other technical and professional personnel on leave of absence from industrial, academic, research, or State institutions to work for the Program.

"(3) The Secretary may pay, to the extent authorized for certain other Federal employees by section 5723 of title 5, United States Code, travel expenses for any individual appointed for a limited term or on a termporary basis and transportation expenses of his or her immediate family and his or her household goods and personal effects from that individual's residence at the time of selection or assignment to his or her duty station. The Secretary may pay such travel expenses and transportation expenses to the same extent for such an individual's return to the former place of residence from his or her duty station, upon separation from the Federal service following an agreed period of service. The Secretary may also pay a per diem allowance at a rate not to

exceed the daily amounts prescribed under section 5702 of title 5, United States Code, to such an individual, in lieu of and when less than transportation expenses of the immediate family and household goods and personal effects, for the period of his or her employment with the Program. Notwithstanding any other provision of law, the employer's contribution to any retirement, life insurance, or health benefit plan for an individual appointed for a term of one year or less, which could be extended for no more than one additional year, may be made or reimbursed from appropriations available to the Secretary.".

SALARY ADJUSTMENTS

SEC. 7. In addition to any sums otherwise authorized by this Act, there are authorized to be appropriated to the Secretary for fiscal year 1990 such additional sums as may be necessary to make any adjustments in salary, pay, retirement, and other employee benefits which may be provided for by law.

AVAILABILITY OF APPROPRIATIONS

SEC. 8. Appropriations made under the authority provided in this act shall remain available for obligation, for expenditure, or for obligation and expenditure for periods specified in the Acts making such appropriations.

ANNUAL INDUSTRIAL TECHNOLOGY REPORT

SEC. 9. Section 5 of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3704) is amended by adding at the end the following new subsection:

"(f) ANNUAL INDUSTRIAL TECHNOLOGY REPORT.—(1) By February 15 of each year following the date of enactment of this subsection, the Secretary, through the Under Secretary, shall submit to Congress a report on the state of United States industrial technology. Each such report shall include, but not be limited to—

"(A) a list of what the Secretary and Department of Commerce technical experts consider to be the most economically important technologies and the estimated current and future size of domestic and international markets for products derived from these technologies;

"(B) a list of the technologies and markets targeted by major trading partners for development or capture;

"(C) an assessment of the current state of United States product technology, process technology, and manufacturing capability in the fields of technology and the markets identified under subparagraph (A), as compared with the current levels of such technologies and manufacturing capability achieved, or future levels likely to be achieved, by major trading partners;

"(D) an identification of the types of research and development needed to close any significant gaps or deficiencies in the technology base of the United States, as compared with the technology bases of major trading partners;

"(E) an analysis of private and public investments in the United States in research and development, including Federal research and development investments, by department and agency, in the specific fields of technology and the markets identified under subparagraph (A); a summary of Federal policies, including research policies, to promote United States industrial competitiveness in those fields of technology and markets; and an analysis of what additional private and Federal actions are needed to close gaps between the civilian technology base of the United States and the technology bases of major trading partners, including what steps are necessary to ensure that the Institute can provide North American companies with the support technologies needed to remain competitive in those fields of technology and markets;

"(F) an evaluation of flows of industrial technology between the United States and major trading partners, including flows of technology through licenses and patent sharing or cross-licensing, corporate invest-

ments and acquisitions, investments in unversities and government laboratories, technical literature, and personnel exchanges, and a summary and analysis of annual foreign investments in, and acquisitions of, high-technology firms or organizations within the United States; and

"(G) a statement concerning any policies, regulatory obstacles, or other institutional problems which, in the judgment of the Secretary, adversely affect the creation and use of industrial technology in the United States or limit the contribution that Federal research and development makes to United States leadership in industrial technology.

"(2) The Secretary may, to the extent permitted by other Acts, collect such information as may be necessary to prepare the annual report required by this subsection.

"(3) The Directors of the Office of Science and Technology Policy, the Office of Management and Budget, and the National Science Foundation, as well as the heads of other Federal departments and agencies, shall provide such information and assistance in the preparation of the annual report as the Secretary may request.".

REPORTS ON MANUFACTURING

SEC. 10. By December 1, 1989, the Secretary shall submit to Congress the following two reports:

(1) A report on the feasibility and advisability of establishing, in affiliation with the Institute, a Quality Institute and a privately funded foundation to support that Quality Institute, the purpose of which would be—

(A) to conduct workshops and company tours to share with managers, engineers, and production employees in the United States advanced techniques for improving manufacturing organization, quality, and productivity, including team-oriented organizational approaches to managing production technology and corporate research and development; and

(B) to help develop and disseminate model curriculums in advanced manufacturing which might be used by technical colleges and other educational institutions to provide training to students and manufacturing company employees.

(2) A report analyzing the advantages and disadvantages of small manufacturing firms in the United States participating in new multicompany manufacturing centers, either on a local or regional scale, and what steps, if any, in the judgment of the Secretary, the Federal Government can and should take to en-

courage the development of such new organizations for manufacturing.

The CHAIRMAN. We are pleased to commence our hearing this morning with the appearance of our Deputy Secretary of Commerce, Hon. Thomas J. Murrin.

Secretary Murrin, we welcome you and we are delighted to hear from you at this time, sir.

STATEMENT OF THOMAS J. MURRIN, DEPUTY SECRETARY, DEPARTMENT OF COMMERCE

Mr. MURRIN. Thank you very much, sir.

Mr. Chairman and Members of the Committee, I am truly honored to be here to discuss the proposed Technology Administration Authorization Act of 1990, S. 1191.

Commerce Secretary Mosbacher has asked me to play a major part in determining the department's role and policy in addressing technology competitiveness issues.

So I appear before you in that capacity.

The stated purpose of this legislation, in your own words, Mr. Chairman, is "to help speed the commercialization of new American technologies and to help restore the Nation's sagging leadership in industrial technology."

Though we may differ in some ways over the details and the approach of this legislation, which authorizes both existing and new Commerce Department technology activities, we certainly agree on the need to encourage the rapid commercialization of new technologies.

Our ability to exploit these technologies will greatly affect both the economic and military security of this country in the years ahead. In fact, as we know, key segments of our economy already have felt all too keenly the impact of new technologies and our competitors' aggressiveness.

When I appeared before you last month for my confirmation hearing, I spoke of five keys to improving the U.S. competitive position in technology. Let me briefly reiterate them along with an example of each.

First is to assure that global competitiveness and world class manufacturing are top priority objectives for U.S. industry. This requires, for example, that our key executives periodically travel abroad to analyze first-hand the capabilities of their toughest foreign competitors. Happily, more of this is happening.

Second is to better educate and motivate our employees, including our managers.

This requires, for example, that many of our brightest and best college students pursue studies in manufacturing technology on campus and then pursue careers in this field. Progress is underway in this regard on several of our college campuses.

Third is to apply advanced technologies more effectively. An outstanding example of this is CIM, or computer integrated manufacturing.

Yesterday, I was the key speaker at a CIM national conference cosponsored by the Department of Defense and by Commerce's NIST, held in Williamsburg. CIM seems to be getting greatly increased support.

Fourth is to seek lower cost sources of capital while aggressively justifying new investments by anticipating the benefits that result, such as improved quality, reduced inventory, and rapid commercialization. Happily, this seems to be increasing also.

Fifth is to sustain quality and productivity improvement. An outstanding example here is the Malcolm Baldrige National Quality Award process.

I am happy to report that the NIST award office has distributed over 40,000 applications, and that these are averaging about 800 per week. I am happy to report that NIST continues to manage this program very effectively.

Much of the burden for these changes falls on U.S. industry, because it is basically industry's job to make or improve new products and processes. But government has an important role to play, and I am anxious to make certain that the Commerce Department does the best job of assisting U.S. industry to develop, commercialize, and use new technologies.

The Omnibus Trade and Competitiveness Act of 1988 and your proposal for fiscal year 1990 funding for these activities have introduced alternatives for Federal Government involvement in this area which will require hard decisions about the degree of government involvement in and support for basic technologies.

Having spent nearly three dozen years in the private sector, with just one month in the government, I find it natural to approach my new job in much the same way as I addressed business management issues. The overall budget process is much like the annual business planning sessions that private sector organizations go through.

The process typically starts by asking or revisiting key questions about recent performance against earlier objectives, plans for expansions or cutbacks, and a host of other strategic issues, including the availability of needed resources, such as people, money, and know-how.

So now I find myself in the familiar position of making decisions, or at least recommendations, about the allocation of scarce resources and where such resources will come from.

I recognize that this Committee has been considering the proposals included in the fiscal year 1990 authorization legislation for several months, and that you are anxious to have a clear and direct statement from the Commerce Department about the degree to which we think the Federal Government should collaborate with industry as it attempts to exploit basic technologies.

I can tell you that in the few weeks that I have become much involved in these matters, I have been actively reviewing the existing programs within the department with a special concern for our technology-related responsibilities.

I have also been reviewing the variety of options and proposals involved, and I am examining management and organizational approaches if any changes are to be put into place.

From a procedural standpoint, I cannot appear before you to recommend specific changes to the fiscal year 1990 budget or to discuss detailed options we are considering for fiscal year 1991. But I can assure you that the administration is evaluating the concepts and principles of these programs, and that we do recognize the growing importance of new technologies.

The advanced technology program offers one approach for the United States to commercialize new technologies. For example, the recently announced research consortia in high temperature superconductivity are excellent examples of private sector initiatives to cooperate with government and others in such emerging technologies.

The pending legislative proposal also would provide ATP funding for advanced electronics, including high definition television, or HDTV.

I know this Committee is interested in our progress in that area.

Frankly, the Economic Policy Council review is taking more time than was originally planned, largely because we are trying to develop policies which would be appropriate to the broader digital imaging and information technologies which underlie HDTV, and partly because HDTV is a very complex and challenging subject, involving production, transmission, and application interests and capabilities, plus a myriad of vexing competitive and international issues.

In related actions which should support U.S industry's efforts to take part in such emerging technologies, the President has proposed to Congress reducing capital gains taxes and extending and making permanent the R&D tax credit. We are in the midst of discussions with the Justice Department on possible proposals to modernize antitrust laws to encourage joint R&D and production ventures.

While we support the principles of encouraging industry to rapidly commercialize new technologies, we are still evaluating the best approach for accomplishing this objective.

We do have several concerns about particular provisions in this proposal, including the loan guarantee plan, and we would be pleased to discuss these individual concerns with your staff in detail after this hearing.

As you know, the department's top priority for NIST funding is for the support of its laboratory activities that accelerate the development and use of science and technology by industry. These are proven programs that industry needs now in order to improve quality and to compete better in emerging technologies.

There are tremendous opportunities for industry to build upon and commercialize NIST technology advances. For example, NIST development of a superconducting electronic chip that can dramatically im-

prove electrical measurements is a case in point. This work has now been incorporated into a major U.S. electronics manufacturer's production process for voltage meters, giving it a higher quality product to sell in the international marketplace.

Other companies are using the device to improve their products' quality.

The real difficulty in endorsing the proposed legislation arises when we look at, among other things, the hard realities of the budget situation. Returning to my business analogy, we have progressed to the point where we agree with the purposes behind these programs. But there may be more cost effective alternatives by which we could achieve the same objectives.

We have to make choices about which programs would be most important and what level of support would provide us with the critical mass to insure success.

With the requirements of the Gramm-Rudman-Hollings law always in clear view, we are now addressing those difficult issues in the context of both the fiscal year 1990 and Fiscal year 1991 budget processes.

I recognize that this Committee must deal with the same tough decisions and budget constraints.

Mr. Chairman and Members of this distinguished Committee, we have the same goals and we want to see the same bottom line results, that is, American industries which are stronger and better equipped to compete in the global marketplace. I assure you that the Secretary and I will strive to work cooperatively with this Committee as you proceed in this authorization process.

I thank you very much, sir, for this opportunity, and will attempt to answer any questions you may have.

[The statement follows:]

STATEMENT OF THOMAS J. MURRIN

DEPUTY SECRETARY OF COMMERCE

Mr. Chairman and Members of the Committee, I am honored to be here to discuss the proposed Technology Administration Authorization Act of 1990 -- S.1191. Commerce Secretary Mosbacher has asked me to play a major part in determining the Department's role and policy in addressing technology competitiveness issues, so I appear before you in that capacity.

The stated purpose of this legislation, in your own words, Mr. Chairman, is "to help speed the commercialization of new American technologies and to help restore the Nation's sagging leadership in industrial technology." We may differ in some ways over the details and the approach of this legislation, which authorizes both existing and new Commerce Department technology activities, but we certainly agree on the need to encourage the rapid commercialization of new technologies. Our ability to exploit these technologies will affect both the economic and military security of this country in the years ahead. In fact, key segments of our economy already have felt all too keenly the impact of new technologies and our competitors' aggressiveness.

When I appeared before you last month, I spoke of five keys to improving the U.S. competitive position in technology. They included:

- o assuring that global competitiveness and world-class manufacturing are top priority objectives for U.S. industry;

- o better educating and motivating our employees and managers;
- o applying advanced technologies more effectively;
- o seeking lower-cost sources of capital while aggressively justifying new investments by anticipating the benefits that result; and
- o sustaining quality and productivity improvement.

Much of the burden for those changes falls on U.S. industry -- because it is basically industry's job to make or improve new products and processes. Government has an important role to play, however, and I am anxious to make certain that the Commerce Department does the best possible job of assisting U.S. industry to develop, commercialize, and use new technologies. Passage of new Commerce technology assignments in the Omnibus Trade and Competitiveness Act of 1988 and your proposal for FY 1990 funding for these activities have introduced alternatives for federal government involvement in this area which will require hard decisions about the degree of government involvement in and support for basic technologies.

Having spent nearly three dozen years in the private sector but just a month in the government, I find it natural to approach my new job in the same way I addressed business management issues. The overall budget process is much like the annual business planning sessions that private sector organizations go through.

The process starts by asking or revisiting key questions about basic operations, possibilities for expansions or cutbacks, and a host of other strategic issues. Now, I find myself in the familiar position of making decisions about the allocation of scarce resources, and where such resources will come from.

I recognize that this committee has been considering the proposals included in the FY 1990 authorization legislation for several months, and that you are anxious to have a clear and direct statement from the Commerce Department about the degree to which we think the federal government should collaborate with industry as it attempts to exploit basic technologies. I can tell you that in the few weeks that I have occupied this position, I have been actively reviewing the existing programs within the Department with a special concern for our technology-related responsibilities. I also have been reviewing the variety of options and proposals for additional activities and examining management approaches if any changes are to be put in place.

From a procedural standpoint I cannot appear before you to recommend changes to the FY 90 budget or to discuss options we are considering for FY 91. I can assure you that the Administration is evaluating the concepts and principles of these programs, and that we recognize the growing importance of new technologies.

The Advanced Technology Program offers one approach for the United States to commercialize new technologies. The recently announced research consortia in high-temperature superconductivity are excellent examples of private sector initiatives to cooperate in emerging technologies. The pending legislative proposal would provide ATP funding for advanced electronics, including High-Definition Television, or HDTV, and I know this committee is interested in our progress in that area. The Economic Policy Council review is taking more time than was originally planned, largely because we are trying to develop policies which will be appropriate to the broader digital imaging and information technologies which underlie HDTV. In related actions which should support U.S. industry's efforts to take part in these emerging technologies, the President already has proposed to Congress reducing capital gains taxes and extending and making permanent the R&D tax credit. We are in the midst of discussions with the Justice Department on possible proposals to modernize antitrust laws to encourage joint R&D and production ventures.

While we support the principle of encouraging industry to rapidly commercialize new technologies, we are still evaluating the best approach for accomplishing this objective. We do have several concerns about particular provisions in this proposal, including the loan guarantee plan, and we would be pleased to discuss these individual concerns with your staff in detail after this hearing.

As you know, the Department's top priority for NIST funding is support for its laboratory activities that accelerate the development and use of science and technology by industry. These are proven programs that industry needs now in order to improve quality and compete in emerging technologies. There are tremendous opportunities for industry to build upon and commercialize NIST technology advances. NIST's development of a superconducting electronic chip that can dramatically improve electrical measurements is a case in point. That work has been incorporated into a major U.S. electronics manufacturer's production process for voltage meters, giving it a higher-quality product to sell in the international marketplace. Other companies also are using the device to improve their products' quality.

The real difficulty in endorsing this legislation arises when we look at, among other things, the hard realities of the budget situation. Returning to my business analogy, we have progressed to the point where we agree with the purposes behind these programs, but there may be more cost-effective alternatives by which we could achieve the same objectives. We have to make choices about which programs would be most important, and what level of support would provide us with a critical mass to ensure success.

With the requirements of the Gramm-Rudman-Hollings law always in clear view, we now are addressing those difficult issues in the context of both the FY 1990 and FY 1991 budget process. I recognize that this Committee must deal with the same tough decisions and budget constraints as we in the Executive Branch are facing.

We have the same goals and we want to see the same bottom line results: American industries which are stronger and better equipped to compete in the global marketplace. The Secretary and I will work with this Committee as you proceed in this authorization process.

Thank you.

The CHAIRMAN. Thank you very much, Mr. Secretary.

I will yield to Senator Danforth who has to go to the Finance Committee.

Senator DANFORTH. Mr. Chairman, thank you very much.

Mr. Secretary, thank you for your testimony.

The bill that the Chairman has introduced prohibits foreign-owned companies from participating in the consortia with respect to HDTV, that would be the beneficiary of a loan guarantee program. If we have a loan guarantee program, does the administration have a view as to whether we should allow participation by foreign-owned companies?

Mr. MURRIN. Senator Danforth, based on discussions with many people in the administration, indeed in the Congress, and, importantly, in industry, there seems to be a consensus emerging that if we could, we would prefer implementing these new initiatives with American companies. That, as you obviously well know, is very difficult.

So, then, it turns on whether or not it is in our self-interest to associate our new efforts with a foreign company which appears to have some outstanding capability that we need to access.

This, in turn, then gets involved in the policies and practices of such other companies regarding their operations in the United States, and favorable factors to team with them and to have them avail themselves of some of these opportunities would include how much manufacturing they do in the States, how many jobs they have here. Do they do significant research here in the States and is it available to benefit our industries? Do they pay their dividends in the States, or do they repatriate their moneys back to their own country? Are they management-led by Americans or by foreigners. And there are a myriad of other factors.

Then, one other key consideration appears to be, as Senator Gore pointed out so well, in this context, does the inclusion or exclusion of such relations with foreign firms allow us or disallow us from participating in relevant, attractive consortia in their home countries?

When you look at this whole picture, it gets quite complex.

So I think the preference is to American and then, on a case by case basis, make the kinds of evaluations I have just outlined here.

Senator DANFORTH. You would rather make the decision case by case, than to have legislation include a specific prohibition?

Mr. MURRIN. Well, I think that is probably prudent at the moment. There are efforts underway to analyze systematically the pros and cons of this matter. The DOD Defense Manufacturing Board, for example, is launching a very comprehensive analysis of foreign investment, foreign management and foreign control, and seeks to make some recommendations to the administration and to the Congress later. But that obviously is a very complex task and is going to take some time.

Senator DANFORTH. When do you think the administration will have developed its position on this matter?

Mr. MURRIN. I'm really not sure, Senator, but it will be some weeks from now.

Senator DANFORTH. That's a very broad way of stating it.

Mr. MURRIN. Well, I can speak for my self here.

Senator DANFORTH. Will it be this year?

Mr. MURRIN. Well, hopefully, as part of the package that is emerging and that will come from the President early next year will be policy provisions, including this one. But I don't want to mislead anybody and act as if I knew that is certainly going to happen. Hopefully that will happen.

Senator DANFORTH. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Danforth.

Mr. Secretary, it constantly amazes me how you outstanding business executives can come and learn so quickly the art of speaking so positively, strongly, and firmly and yet say nothing.

I say that most respectfully because I think we are very fortunate to have you here and I understand your dilemma.

Let me elaborate on one question before Senator Danforth leaves.

Let's assume that we know how the awards are made. We know how President Reagan and under Secretary Verity how they made the awards for the first three NIST manufacturing technology centers.

Now, just for purposes of analysis here, let's assume that we had two or three more awards to make. How would you, as the secretary administering this program, make those awards? We are all concerned, as has been indicated, that we just do not pass another pork-bill kind of program which is not going anywhere. The need for these centers is great and quality applicants are out there. The awards can be made, I think, on very good, sound meritorious bases.

How would you do it?

Mr. MURRIN. Mr. Chairman, as I hope you appreciate, I have had only limited familiarity with the centers.

My impressions are that the process that has been followed is excellent, that the selections are very appropriate, that the early indications are that these centers will, indeed, be very successful, and that, certainly, we together, the Congress and the administration, ought to look to how they perform in the near-term and consider whether or not they ought to be replicated.

So I have nothing but admiration for what has been accomplished so far. But as I am trying to say to you, and you well know, the matter of how many additional centers and how they are going to be funded is something that I cannot specifically commit to at the moment, sir.

The CHAIRMAN. I understand that, about funding. I was just trying to get into the process.

You used the word "admiration" for what you have seen so far. You have had an opportunityto look at the three centers that are now operating. Do you think they are operating on a salient basis?

Mr. MURRIN. I have been briefed on them and it is very impressive, very encouraging.

I might say, sir, the new National Coalition for Flexible Automation Systems, which was announced this week, very much follows the principles of the three centers that we are talking about, and I think was encouraged in its initiatives by the success of those early centers.

I mentioned that yesterday, I participated in the beginning of a week-long national conference on computer integrated manufacturing, co-sponsored by DOD and Commerce, but involving industry and academe, and much of what is on the agenda and many of the initiatives being worked on there relate fundamentally to the sort of initiative that is found in your Hollings centers.

I think this all begins to tie together, and I think we should feel good that this is serving significantly to stimulate other similar initiatives.

The CHAIRMAN. I appreciate that.

Jumping back to the other point of discussion, to awarding only American applicants for these research support grants, loan guarantees, or otherwise, this is the intent of the bill. The whole idea here is to catch up with our foreign competition. It is quite obvious that the way to do this, is to try to avoid awarding foreigners more financial assistance.

The awards should be going to the American endeavor.

I would appreciate it if you would, in the next four or five days, would examine the research currently going on in HDTV.

I have been told that besides Zenith there are really only two TV producers in the U.S., Thomson and Phillips, which are both foreign owed. But the makeup of their research and production personnel is predominately U.S. citizens. The fruits of their research benefits the United States and United States manufacturers. I am not positive of this, though, and I wish like you to look into it. I understand that they do, as you indicate, pay those dividends.

It seems that Commerce has also been looking at whether Holland, France, or whatever, they allow reciprocal opportunity for American corporations to engage in like fashion in research on their soil.

I guess what our problem is that we have to face the facts the real world presents us. Moreover, that is the only way to go because their is a problem of timing here. If we are really going to play catch-up ball and get ahead of our Japanese competition, then we have to take the cards dealt us. It would be fine to U.S. firms should be eligible to participate in a research consortium. But if the U.S. is going to take a ten year period to really develop some positive research, it would be too late, we would be out of the game.

It's like throwing a drowning man who is 50 yards offshore a 25 foot rope with the lifesaver. Just half-way is no good at all.

That is what disturbs some of us on the Committee. We have been listening to Thomson, Phillips, and some of the others, who say now wait a minute, we're American. I know we're foreign-owned, but we're really American, and we deserve consideration from the standpoint of being realistic, to try to attain the same objective of helping us develop American technology.

If you can help us with your staff here in the next few days, our staff will be working with you.

My final question concerns timing, and then I will yield to my colleagues. Of course, it was Secretary Mosbacher himself who emphasized the timing in this. And, of course, it is a little disturbing that we are, at the end of July and going into August, and we have yet to have the Assistant Secretary to even be appointed.

I see that they are doing a lot of things over there in this administration. They are taking care of the turtles and they are taking care of the $100,000 givers.

But they have not done anything about technology, which they initially said was their first order of business.

So, if you could accelerate thing for us, we would appreciate it very much.

Mr. MURRIN. We will go to work on both of these matters, sir.

Your views on the foreign situation state better than I could the intent of my comments, that whenever we can go with only American organizations, that seems to be the consensus view. But occasionally the reality is that it may be in our self-interest to team with others, as you are referring to.

As to the timing, if the Secretary were here, I think he could say better than I that he has been working hard and I have been much involved, frankly, on the HDTV matter. But it is, as someone put it, quite a vexing situation.

Let me just give you one specific, if I may,to give you a flavor for how challenging this is.

I personally talked to a variety of people who seemingly are expert on the fiber optics aspect of this. It does seem to be prospectively in our self-interest in the States to accelerate the introduction of digital based systems using fiber optics nets, if we could do that.

But when I asked these experts how long do they think it will take before that becomes feasible in a total sense, considering the fiscal as well as the societal aspects, the estimates seriously ranged from five years to 35 years.

This presents quite a dilemma, frankly, to me and to the Secretary and others in trying to come up with a game plan as to what to recommend as a specific course of action. This is just one aspect, among many, many others, as to the overall HDTV situation.

So we ask for your forebearance, sir, in our continuing to work on this.

The CHAIRMAN. Thank you, sir.

Senator Rockefeller.

Senator ROCKEFELLER. Thank you, Mr. Chairman.

I just want to say on a personal note how pleased I am about Secretary Murrin. I knew him and his work when he was at Westinghouse. His is a very distinguished career. I think that Secretary Mosbacher and the President, once again, have in this area chosen very wisely.

I am delighted that you are in public service. Most people look upon public service as a rather frivolous thing these days, and I think we are lucky to have you.

Mr. MURRIN. Thank you, sir.

Senator ROCKEFELLER. If one goes down the list on where to spend what little money we have, we face a whole set of problems. S&L's are $100 billion. Atomic waste is $100 billion. Drugs are, what, $30 billion to $40 billion. Long-term care, health care, is $40 billion to $60 billion. The uninsured and the underinsured are, who knows, $20 billion or $30 billion. Catastrophic health care insurance has taught us that people want to receive benefits but do not want to pay for them. Uncle Sam should pay for everything, or everybody should pay for everything. There is child care, which is only $2.5 billion to $3.5 billion. Sixty percent of American women are working with no place to put their kids, they both have to work. There are environmental costs, and I don't know how much of that the government picks up. There is law enforcement and Federal prisons, what is that, $20 billion, $10 billion. The space station is $33 billion, and that is just to get it up there.

So, I guess, in a sense, we really can't afford to do anything. I mean we are overwhelmed by costs that we are going to have put upon us.

We have a $3 trillion national debt—or is it $2 trillion?

The CHAIRMAN. It is right at $2.8 trillion, and they are going to increase it in the next ten days to $3.1 trillion.

Senator ROCKEFELLER. To $3.1 trillion.

So really, they say, there is really no reason to spend more money here. We are already down the slide—and I am trying to be slightly humorous here, though nobody seems to be catching on.

Then you get back to what it is it that it seems to me a government and a Department of Commerce ought to be doing, which is saying look, we have all these expenses, but we have to create long-term value in our society, in our economy. We have to make investments now be-

cause the only way we are going to have money, now or in the future, to pay for some of these costs, which will continue and which will grow, is to be productive. It means we must stay up with EC 1992 and stay up with the Japanese and a lot of other things.

It won't be easy.

I don't even want to ask a question from my musings that it is simply a personal observation.

Little things are worth doing, and often things which cost the least are things which get cast aside the most quickly unimportant.

Senator McCain and I feel very strongly about something called technology extension. The Federal Technology Extension Service, is in Senator Hollings' bill, as it ought to be. It addresses the question of how do you take this incredible institution, which used to be called the National Bureau of Standards, now NIST, an incredible place out in Gaithersburg, and get businesses to relate to what it is doing in advanced manufacturing, automated manufacturing, advanced materials, advanced ceramics, all kinds of things. Then, beyond that, how do you get small businesses and medium sized businesses in rural States like West Virginia and in nonrural States like New York or California, to relate to what it is that is being done by way of technology at their State universities?

So, you have to get information from the Federal level to business, Federal to university, and then on to State universitys and small and medium sized businesses.

For example, to make it prosaic, I know that at one Western university there is very good research being done on coal mine ventilation, which is not being picked up by our coal mines.

So this becomes a problem—how do we do that?

Senator McCain and I would ask that you pay attention to this issue. How do we extend knowledge in this country? How do we get people to see that what is being done at a Federal institution, at a State university, has meaning to them?

Secondly, you talked about motivating people. I was in West Virginia yesterday, at something called the Governor's Academy, which I am proud of, because I started it when I was governor. It brings the best and the brightest of West Virginia together for a month to study.

I asked them how many of you are going to become either scientists, mathematicians, or engineers, and, by golly, two-thirds of them raised their hands. I was thrilled.

You have to worry about things like that. As I have said often before, two-thirds of American industry is run by either lawyers, accountants or marketing specialists. Two-thirds of Japanese industry is run by scientists, mathematicians, or people trained in math or in engineering.

You know that. That is your field.

So, how do we motivate American young people to get into these fields?

We can bribe them. There is a bill that I put in. That is, you major in math in college—not education with a minor in math, science or engineering—but a pure math major, a pure science major, a pure en-

gineering major, and you bribe them to stay there with Federal money. You say we'll give you $7,500 for one year, or $15,000 for two years for your academic work at college if, after you complete your college work, you will go and teach at a junior high or a senior high public school for either two or four years. This is based on the theory that, just as joining VISTA changed this person's life, going to teach will change a certain percentage of those math, science, and engineering majors and make them want to teach, and, hence, motivate young people and bring people forward.

I would like your support for the bill. But, more importantly, what does the Department of Commerce do to help us in the Congress and in the Executive Branch to get people to concentrate on what is important in this country and what will create value for future generations.

My third observation is again prosaic an self-serving. That is when I am at my best.

There is a small program in your department called the Japanese Technical Literature Program. Committee Members have heard me talk about this ad nauseum. And I will continue to do because of an interesting phenomenon, which is that American business does not seem to be interested in what other countries are doing.

You have seem to rebutted that in your comments. But there was only one private company in this country which was taking information from the 10,000 Japanese technological journals that are printed by the Japanese each year in Japanese and which are available around the world if somebody will translate them. These are on everything from refrigeration to superconductivity, anything and everything.

As you know, I essentially define the Japanese miracle as essentially their purchase of our technology for over 40 years. We sold them our technological edge for about $15 billion or $17 billion, in 33,000 different transactions.

It is a miracle, but it is a miracle which we sold them. And yes, they get high points for education, hard work, and all the rest of that.

But American business does not seem to be interested in what this is producing for them. The company that I referred to went broke in December. Nobody would buy their product, the translation of Japanese technological journals on refrigeration or superconductivity. Nobody in American industry cared.

So we have mandated in the Department of Commerce a very small program called the Japanese Technical Literature Program. Jacob Javits' daughter, who is superbly bilingual, is running it.

I would commend it to your attention.

All it does is translate a certain number of those articles that come out from Japanese into English and make them available to the government, to industry, to universities, at cost.

That program strikes me as not a particularly "unstupid" way of, again, trying to spread information, to get Americans to understand what is going on in the world, and, hopefully, make them respond.

I apologize for those observations, but I just choose to make them. I wonder if you have any response.

Mr. MURRIN. Senator Rockefeller, thank you very much for sharing those views. I assure you that we, and I particularly, will follow up on each of those areas.

Let me comment briefly, if I may, on the last one. I am interested in all of them, but the last one hits a particularly resonant note with me.

I have been visiting Japan occasionally since November of 1964. It has become an avocation of mine to try to understand well what motivates those people and how they do the quite impressive things they do.

I do not claim to really understand all of that, but I would assert that I know as much about it as most any American business person I have ever met.

In that context, at Westinghouse, one of my particular efforts was aimed at encouraging our people not only to become familiar with their literature and their activities, but to go there and study first-hand what they are doing.

I can tell you, sir, that the trips to Japan that those people made were clearly the most cost effective, most stimulating, most valuable single things they did in our entire quality and productivity improvement effort.

What the Japanese do is not mysterious. Americans quickly understand what they do when they see it first-hand. Usually they get either a little bit distressed or they get very stimulated, or both. That is kind of what we need, I think, oftentimes more than anything else.

When I became associated with Commerce, I learned about this program. I am, frankly, somewhat puzzled that it has not been more effective. But I think, frankly, the challenge is more on the reader end, the user end, the industry end, than it may be on the Commerce end.

In any case, I assure you that this is a pet interest of mine, to try to support vigorously this effort and to try to make it be much more effective than perhaps it has been.

One of the things I am doing regularly, at least every two weeks, is meeting with our intelligence people, who, it turns out, have a tremendous amount of relevant knowhow on industrial developments, not just military or political related developments, but industrial related developments.

But, for whatever reason, the essence of those insights have not yet been effectively communicated to our leaders in industry and perhaps even in government.

So, to the extent we can do any good and I can do any good, I assure you, sir, that this is something that will be a top priority effort.

Senator ROCKEFELLER. Thank you.

Thank you very much, Mr. Chairman.

The CHAIRMAN. Thank you very much, Senator Rockefeller.

Senator McCain.

Senator McCAIN. Thank you, Mr. Chairman.

Mr. Murrin, one of the key items in this authorization is the part of it that authorizes $30 million in matching government assistance for industry-led research. It also provides financial assistance to joint ventures, which include a foreign company. It authorizes $225 million in Federal loan guarantees, $50 million in 1990, $75 million 1991, and $100 million in 1992.

Part of this decision making process, I guess the integral and key and crucial aspect of this authorization, lies in the eye of the beholder, as far as the importance of HDTV to the future of American electronics industry, the future of American competitiveness in the world.

I would like your personal views, given your extensive background and experience, on how important you think HDTV is to America's future.

Mr. MURRIN. Senator, I welcome that question. I think—and I believe here I am sharing the views of Secretary Mosbacher and others, but I certainly speak for myself—I think HDTV is crucial. It not only holds the prospect, if we could launch a very effective initiative, to regain a significant involvement in the important area of consumer electronics per se, but it clearly is going to impact, favorably or unfavorably, on the future of American interests in much of the computer field, in the communications field, and in the semiconductor fields.

All of these are vital, as you well know, to our national security. They underlie the effectiveness of virtually all of our weapon systems and they are tremendously significant to our manufacturing competitiveness. They underlie, for example, the effectiveness of our aerospace industry, which, as you well know, is the one large remaining manufacturing segment, where we have a very favorable balance of payments.

So I think the importance and the potential are quite clear.

Where we have real difficulties, frankly, is when we get down to trying to work out a specific game plan. I have occasionally been with Secretary Mosbacher and occasionally have been on my own in asking individual and groups of very much involved and very capable businesspeople what, specifically, would you like Commerce to try to do. I'm not promising that we can achieve in practice what their wishes are, but I would try to solicit what their wishes are.

As I touched just superficially in the earlier case on fiber optics, depending who you talk to, you get quite dissimilar views. Particularly, if you talk to the people in the production area, they seem to be feeling quite comfortable about the sort of Hollywood aspects of making films, producing them and disseminating them. When you get into the transmission area, you have a myriad of interests. I touched on fiber optics. I got the satellite folks, the in-place hard wire communications folks, the microwave folks, all kinds of combinations of these. Then, when you get over to the gismo itself, there is some anticipation that the early units would use cathode ray tubes, and then they'll move to flat panels, and they'll use various, different types of hardware and software.

You get into a myriad of not only complex and very technical and business aspects, but also as many views about how to proceed.

So the good news, I think, is there is consensus that it is terribly important and terribly opportune. I think there is a conviction—certainly I have it—that if we could effectively get our act together and move aggressively forward, we could make tremendous progress in regard to HDTV and these related areas. But, to get our act together, at least in my perception, sir, is proving to be really challenging.

Senator MCCAIN. Mr. Murrin, if it is indeed crucial and vital, to use those words, you do accept the premise that the United States Government should be involved in some way in assisting us in addressing the competitive aspect of acquiring this very important technology, as you so adequately described? Do you accept that thesis, that the government should be involved in assisting this industry?

Mr. MURRIN. I think in principle, yes.

If I may just intrude for a moment, there does seem to be consensus regarding the people who thought about this carefully—and many people are doing that, obviously—that if we could change our capital gains regulations, if we could change our R&D credit situation, and if perhaps we could also liberalize the antitrust laws regarding production based consortia, there does seem to be a consensus emerging that those three factors would be very supportive. They would assist.

Senator MCCAIN. Does the assistance of the government, given that this is crucial and vital, extend to direct financial assistance?

Mr. MURRIN. Well, I'm not sure, to be honest with you.

At Commerce, we are working very closely with the DARPA people. As you know, they have $30 million of funding in that initiative.

Senator MCCAIN. Do you support that so far?

Mr. MURRIN. Very much so. Yes, sir.

Senator MCCAIN. But you say at this point you do not support further financial assistance, whether it be from DOD, Commerce, or any other area?

Mr. MURRIN. Well, with all respect to DARPA, I think it is still not completely clear as to the level of financing that seems appropriate and the specific form that it should take.

But it is being worked on. We are cooperating with that, and we hope to come to you soon, after the administration has worked this out, with specific recommendations.

Senator ROCKEFELLER. Would the Senator yield?

Senator MCCAIN. Thank you. I would be glad to yield.

Senator ROCKEFELLER. I think I'm thinking along those same lines.

Mr. Secretary, I have heard a number of people say and I have read in a number of places, that it is already too late for the United States on HDTV. That the Japanese are five to ten years ahead of us and it does not make any difference how much money we put into it because it is too late. I hear that we may be good on some of the basic research on it, but that one way or another, they are already out in front.

So, if something is to be done, it has to be done, first, tremendously rapidly; and, secondly, with money—the $30 million in DARPA is nothing. I mean, it is $10 million for three years. What I think is required is $100 million for three years if we are going to do anything.

Isn't that what you are trying to get at here?

Senator McCAIN. [Nods affirmatively]

Senator ROCKEFELLER. We can't spend money, but we do want to do HDTV. We may be behind, so we'll go at it insufficiently to make sure that we don't get there, but that we can say that we tried.

Senator McCAIN. I would agree with everything that you are saying.

What I am trying to establish here, too, Jay, and Mr. Chairman, is if we support this, if it is vital to the future of America in a broad spectrum of ways, which Secretary Murrin has I think very eloquently described, then we have to make a decision soon as to how we want to support it.

Is it through SEMATECH? We have an organization, and that is my next question. We have an organization called SEMATECH right now, which the Federal Government has put money into.

Is that an appropriate organization?

I am describing the areas of catching up, and I agree with what Senator Rockefeller said about how they are ahead of us in a variety of ways in development of this technology. But the spectrum allocation and other aspects that you described I think can be addressed through other means.

No HDTV is going to come to America unless there is a spectrum allocation, right? Is that right, Mr. Murrin?

Mr. MURRIN. Yes, sir.

Senator McCAIN. So we do have that hammer over the situation. But unless we have a technology ready to go, sooner or later they are going to invade—I don't like to sound too melodramatic here—if this technology is as important as most people believe.

But there are other opinions in America that say well, this is just another television set, or we didn't fund the SST when the Concorde was the competitor and we didn't lose the aircraft industry, and so on. There are other arguments on the other side.

I am trying to establish here what this administration's position is, and if it is vital and crucial, as Mr. Murrin says, then I suggest that we had better put our money where our mouth is or say that we have given up.

But, as Senator Rockefeller just said, to spend $30 million and then say we will come back to you in some weeks I think begs the question in that we need to address it and come to a decision.

I would suggest that if it is as important as we say, this should be a subject of presidential attention as well as that of the Secretary of Commerce.

I will end up, Mr. Murrin, by saying that you know the American Electronics Association and others have come forward with some pretty specific and concrete proposals. What is your opinion of that proposal, for example, that of the AEA, which I believe will testify later on?

Mr. MURRIN. Well, I have sat with several of those people on several occasions. Indeed, they are much more knowledgeable about these matters than I. And, their initiatives certainly deserve careful attention.

As to exactly how to implement those and how to raise the moneys, I am not able to tell you, sir, at this point how to do that, if, indeed, it should be done.

Senator MCCAIN. I understand. But we are cutting through that and are talking about the Office of Management and Budget and the way that you are handicapped, as Senator Rockefeller described, by the budget process. I understand that.

But what I am hoping is that we will make a determination soon as to the criticality of this technology. And if so, if it is as crucial and vital as you say, we will make some decision as soon as possible.

I thank you, Mr. Chairman and Mr. Murrin.

The CHAIRMAN. Thank you, Senator McCain.

Senator Lott.

Senator LOTT. I would be prepared to yield my time.

I thank you for coming, sir, and I would like to hear the next panel. So I would be happy to yield my time.

The CHAIRMAN. Very well.

Senator Pressler.

Senator PRESSLER. Thank you very much.

Let me ask one question. This Committee is currently considering a bill to establish a super computing network, or to assist in it.

I am very interested in this. It would facilitate the exchange of information. We are in a situation where super computers are here, but we have a lot of problems in terms of nationwide hookups, and whether the government should or should not be involved, et ceterta.

What are your views on this? Will you be active in this?

Mr. MURRIN. Let me first say—and I am sorry that the others had to leave—though I do not claim any expertise in regard to HDTV, it does seem that we, as a country, can put together a plausible game plan which could exploit the areas where we are still very outstanding.

We do seem, for example, to have the preeminent position in panel technology. But we don't know yet how to quite implement that.

We do seem to be very, very strong in super computers and in netting these, as indeed you are asking about.

So, in principle, initiatives to accelerate the commercialization, the effective implementation of American technology, particularly where we are still preeminent worldwide, merit very careful consideration.

I think the proposal you are referring to, to the extent I am familiar with it, certainly qualifies that way.

Again, when we get down to specifics, how to precisely try to do that, how to fund it, support it, and manage it, I don't think we are quite there.

But all of my early reactions are certainly very favorable toward that.

Senator PRESSLER. What can we do to promote that?

Mr. MURRIN. Well, I really am not yet familiar enough with it to answer intelligently. But I can assure you that this is one of the areas I will be becoming more familiar with, and hopefully I can return later and make some credible recommendations to you.

Senator PRESSLER. Thank you.

The CHAIRMAN. On that point, Mr. Secretary, the other governments are all part and parcel of this, whether it be Phillips or Thomson. We can go down the list of all the Japanese entities that are financing here.

We had Boone Pickens who came and visited. We saw all the articles of Japanese quality manufacture that are sold in America for 25 percent to 50 percent less than what they are sold in Japan. That society and the way they have structured it takes that into account and they allow it. But we would not.

In other words, they are pro-trust and we are anti-trust.

But I am like Senator Lott. I'd like to move to that next panel.

We are very grateful to you, sir, for your appearance here, and we will be working with you. If you could, help us with the wording of this, how you would suggest handling the problem of the foreign entity who is doing the majority of the research, let's say in HDTV, not being dealt out of the deal or dealt into the deal, and the disparity to the American company. I want to see how to handle that. It is a touchy problem.

Mr. MURRIN. Thank you, Mr. Chairman. Thank you again for this opportunity.

I am tremendously interested in your panel, also, and I plan to stay and listen.

So thank you all.

The CHAIRMAN. Thank you, too.

We will have now our panel come forward. It consists of: Dr. John McTague, Vice President for Research of Ford Motor Company; Mr. Tom Long, the Vice President and General Manager, Technology group, Tektronix; Mr. Griffith Resor, President of MRS Technology; and Mr. Morton bahr, President of the Communications Workers of America.

If there is no objection, Mr. Bahr, we will just start from my left and go in the direction of my right, with Mr. Bahr, Mr. Long, Dr. McTague, and Mr. Resor.

Mr. Bahr, we would be delighted to hear from you at this time. Each of your statements will be included in the record in their entirety. The individual may give it in full or highlight it, as you wish.

STATEMENT OF MORTON BAHR, PRESIDENT, COMMUNICATIONS WORKERS OF AMERICA, REPRESENTING THE COMMITTEE TO PRESERVE AMERICAN COLOR TELEVISION (COMPACT)

Mr. BAHR. Thank you, Mr. Chairman.

I am Morton Bahr, president, Communications Workers of America.

I am pleased to be able to testify today on behalf of COMPACT, the Committee to Preserve American Color Television, a labor-industry coalition organized in 1976.

COMPACT is a labor-industry coalition organized in 1976 to oppose unfair and injurious imports of television sets from the Far East.

The members of COMPACT and American workers view the emergence of advanced technologies, in particular HDTV, as critical to this country's future in the electronics industry.

We also believe that constructive government/labor/industry cooperation in developing and implementing policies to promote HDTV technologies can stop the erosion in the competitiveness of the United States' electronics industry.

We believe that if our own government had joined domestic labor and industry by acting decisively against dumped imports of television sets from Japan, Korea, and Taiwan over the last ten years, we would not be here today testifying in support of this Committee's efforts to help restore the competitiveness of the United States electronics industry.

The members of COMPACT and American workers greatly appreciate the efforts that this Committee is now making to improve the competitiveness of the electronics industry. Without a strong consumer products industry, our electronics industry cannot achieve the economies of scale needed to remain a world class player.

The electronics industry in this country has been hurt badly over the past decade by an onslaught of dumped imports, including semiconductor devices, color television sets, and picture tubes, to name only a few items.

S. 1191 represents an important initiative to turn things around and restore the competitiveness of this once great industry. We support the activities under the Department of Commerce's Advanced Technology Program that would be made possible by S. 1191.

COMPACT does have a concern over who should be permitted to participate in these efforts. The domestic television industry has changed much over the last ten years. Except for Zenith, it is difficult to tell from the names of the companies in Exhibit 2 of my testimony, who makes these televisions.

Thomson, a French-owned company, now owns the General Electric and RCA brand names. Philips, a Dutch-owned company, produces Sylvania, Magnavox, and Philco brand name television sets in this country.

These two companies account for almost 48 percent of the American workers in the television industry. When combined with Zenith and the traditional suppliers of glass for picture tubes, Corning and Owens-Illinois, these plants still represent over 70 percent of the workers in the domestic industry.

Mr. Chairman, the union and company members of COMPACT have lost many jobs over the last ten years. The sad fact is that our workers can no longer depend solely upon American-owned companies for their jobs. It is now clear to the American worker that the most important

question is not who owns the stock of the companies that produce television sets, but, rather, whether those producers are committed to domestic research and development and domestic production of television sets.

As far as domestic workers are concerned, if foreign-owned companies have made a commitment to domestic R&D and domestic production, they and the workers they employ are entitled to the same treatment as domestically-owned companies who are also willing to make a similar commitment.

Mr. Chairman, the provisions of S. 1191, as presently drafted, would exclude all foreign-owned firms from participation in U.S. Government sponsored R&D joint ventures. This blanket exclusion fails to take into account the commitment of foreign-owned firms to creating American jobs that we believe would not be good for American workers.

We would propose that S. 1191 be amended, I might add, along the lines indicated by Senator Gore in his opening remarks, to permit companies which demonstrate a significant commitment to domestic research and development and domestic production, to be considered for participation in government-sponsored research programs.

After considering the commitment of specific firms to domestic R&D and domestic production, the Secretary may also wish to evaluate other relevant factors, including the availability of reciprocal opportunities for American companies to invest in foreign countries and to participate in similar foreign government R&D programs.

Our preliminary look at the facts indicates that many U.S. companies have been allowed to participate in government-sponsored research in Europe. Thus, it may be a serious mistake for our government to exclude qualified, foreign-owned firms from our programs.

We also feel very strongly that subsidiaries of foreign companies that have been persistent offenders under the U.S. dumping and unfair trade laws should not be permitted to participate in U.S. Government funded research joint ventures.

We urge that the private sector aspects of any new government program include adequate representation of labor.

Mr. Chairman, I thank you for the opportunity of presenting these views. The members of COMPACT, including the Industrial Union Department, the AFL-CIO, and all of its affiliate labor organizations, applaud your efforts to address the critical issues surrounding the competitiveness of the United States electronics industry.

You, Mr. Chairman, have consistently been a leader in the continuous struggle to keep the United States as a world class competitor. We look forward to working with you within the framework of our remarks this morning.

Thank you.

[The attachments referred to follow:]

Production Workers in
U.S. Color Television Facilities

Company	Plant Location	Product Manufactured	Union Affiliation	No. of Employees	Subtotal	Percent of Total	Cumulative Percent
Thomson	Bloomington, IN	Components	IBEW	1766			
	Bloomington, IN	CTV Assembly	IBEW	1604			
	Mocksville, NC	Cabinets		626			
	Marion, IN	Tubes	IBEW	1982			
	Circleville, OH	Glass	IBEW	780			
	Scranton, PA	Tubes	IUE	1742	7920	25.92	25.92
Philips	Arden, NC	Parts	IUE	400			
	Greeneville, TN	CTV Assembly	IUE	3200			
	Jefferson City, TN	Cabinets	IUE	700			
	Ottawa, OH	Tubes	IBEW	2300	6700	21.92	47.84
Zenith	Springfield, MO	CTV Assembly	IBEW	2000			
	Melrose Park, IL	Tubes	IBEW/IUE/AFL	2500			
	Kostner Ave., IL	Parts	UE/AFL	750			
	Franklin Park, IL	Parts	UE/AFL	87			
	North Lake, IL	Tubes	UE/AFL	63	5300	15.80	63.64
Corning Asahi	State College, PA	Glass	Flint Glass Workers	650	650	2.13	65.77
GE-NEC	Columbus, OH	Glass	IUE/AFL-CIO	530			
	Pittston, PA	Glass	IUE/AFL-CIO	670			
	Perrysburg, OH	Glass	Flint Glass Workers	575	1675	5.48	71.25
Harvey Ind.	Athens, TX	CTV Assembly	IBT	800	800	2.62	73.87
Toshiba	Lebanon, TN	CTV Assembly	IBEW	800			
	Horseheads, NY	Tubes	IBEW	1000	1800	5.89	79.76
Sony	San Diego, CA	Tubes/CTV Assembly		1500	1500	4.91	84.68
Matsushita	Franklin Park, IL	CTV Assembly		600			
	Troy, OH	Tubes		250			
	Vancouver, WA	CTV Assembly		250	1100	3.61	88.28
Mitsubishi	Santa Anna, CA	CTV Assembly		550			
	Braselton, GA	CTV Assembly		250	800	2.62	90.90
Sharp	Memphis, TN	CTV Assembly	IBEW	715	715	2.34	93.24
NEC	Mcdonough, GA	CTV Assembly		400	400	1.31	94.55
Sanyo	Forrest City, AR		IUE	400	400	1.31	95.86
Gold Star	Huntsville, AL	CTV Assembly		400	400	1.31	97.17
Samsung	Saddlebrook, NJ	CTV Assembly		250	250	.82	97.99
Orion	Princeton, IN	CTV Assembly		250	250	.82	98.81
JVC	Elmwood Park, NJ	CTV Assembly		100	100	.33	99.14
Hitachi	Anaheim, CA	CTV Assembly		90	90	.29	99.43
				Grand Total:	30615	100.00	100.00

Government support of advanced technology research and development has become more common in recent years. This trend is evident both in Europe and in the United States.

Three of the more well known European R&D programs are ESPRIT, (European Strategic Program for Research and Development in Information Technology), RACE (Research in Advanced Communication for Europe) and BRITE/EURAM (Basic Research Industrial Technology/Advanced Materials Program) which are directed and funded in part by the European Communities. These "framework" programs involve pre-competitive R&D in advanced information, communication and industrial technologies. EUREKA also supports (but does not direct or itself fund) more than 165 R&D projects, including an R&D project in HDTV commonly known as "EUREKA 95." EUREKA acts as a "clearing house" for product or market oriented research projects for European governments and private industry and assists them in finding industrial, scientific and financial partners throughout Europe.

There now appears to be some question in the United States about the eligibility of U.S. firms to participate in these European R&D programs. An examination of the status quo, however, suggests that U.S. firms have participated in the major European government supported R&D programs through their European subsidiaries for many years. Indeed, during the past five years more than thirty U.S. firms have participated in just the four European R&D programs named above. The following Table shows the extent of such U.S. firm participation.

PARTICIPATION BY EUROPEAN AFFILIATES OF U.S. COMPANIES IN EUROPEAN COLLABORATIVE R&D PROGRAMS (1984 TO PRESENT)

ESPRIT (I & II)	RACE	BRITE	EUREKA HDTV PROJECT
ITT*/	ITT*/	ITT*/	ITT*/
IBM	IBM	Donnelly	Captain Video
AT&T	AT&T	Ford Motor Co.	LTV
Digital	Hewlett Packard	Rockwell	Covia
Hewlett Packard	Texas Instruments	Lee Cooper	
Sybase	GTE		
Swift SC	DHL		
Moog Controls	Dupont		
3M	Ford Motor Co.		
DuPont			
Dow Chemical			
Honeywell			
Artificial Intelligence			
Babcock & Wilcox			
Cambridge Consultants			
Intersys Graphic			
Peat Marwick McLintock			

*/ ITT companies participating in one or more projects included Bell Telephone, SEL, Face Standard, ITT Europe, ITT Germany and Standard Electrica. Controlling interests in many ITT companies have been purchased by CGE/Alcatel so these ITT companies' participation as "U.S. firms" would predate such acquisition. An ITT company not controlled by CGE/Alcatel still remains active in the EUREKA HDTV project.

The CHAIRMAN. Thank you very much.
Mr. Long.

STATEMENT OF TOM LONG, VICE PRESIDENT AND GENERAL MANAGER, TECHNOLOGY GROUP, TEKTRONIX, INC., REPRESENTING THE COUNCIL ON SUPERCONDUCTIVITY FOR AMERICAN COMPETITIVENESS

Mr. LONG. Good morning, Mr. Chairman and Members of the Committee. My name is Tom Long, and I am Vice President of the Technology Group at Tektronix in Beaverton, Oregon. Tektronix is a $1.4 billion corporation established in 1946.

We are a leading manufacturer of test and measurement equipment, computer graphics, and communications equipment, including professional television.

Tektronix is now becoming increasingly involved in the application of superconductivity to commercial products. I am appearing before you today as a member of the Board of Directors of the Council on Superconductivity for American Competitiveness, known as CSAC.

CSAC is a nonprofit trade group formed in 1987, and is concerned with America's relative global posture with regard to capitalizing on the exciting, emerging technology of superconductivity.

CSAC has evolved into the only national trade organization addressing superconductivity in its commercial context. The CSAC membership is comprised of small businesses, diversified corporations, entrepreneurial companies, universities, and interested individuals.

CSAC membership is limited to American citizens and U.S. owned and controlled entities.

With that introduction, I would like to emphasize a number of points made in my written testimony.

First, I would like to give you just a brief definition of superconductivity because some people don't know what it is.

Superconductivity is the ability of certain materials to conduct direct electrical current without resistance. The material will exhibit the Meissner effect or the repulsion of magnetic fields which enable the levitation effect.

Next I would like to address the issue of Japanese involvement and what they are doing in Japan in order to support this technology.

Very recently, $800 million was granted to ten of the largest companies in Japan to research almost every nook and cranny of superconductivity. It is something that U.S. companies cannot stand off alone. The Japanese companies, along with the Japanese Government, have targeted the U.S. markets and we must have help in this defense from the government.

The application of superconductivity is most likely to occur in the microelectronics area, where high speed instrumentation and high speed computers can be built most effectively.

The principal limiters on high speed computing today is the distance signals must travel and the heat density created when you put many of these components together.

Today's computers could be made faster by bringing the active components closer together. Of course, this causes considerable heat buildup, and it is a problem that possibly can be overcome with the use of superconductors, which would cause very little heat dissipation.

This will require, however, a concerted effort in the U.S. to develop not only high temperature superconductors, but complete systems, including the cryogenic coolers.

We need to focus on the high TC material as well as continuing to work on low TC materials. High TC materials are most readily used today and exhibit fewer of the problems, and, of course, would make it possible to build products today.

One of the problems that we are having today is that there is no focused effort in the U.S. to build product. This is what CSAC is proposing and the corporation called Super Chip is attempting to cause to happen.

We need technology enablers. Without significant advances in cryosystem technology and interconnection technology, the superconductors themselves are almost useless.

We need to create an infrastructure. There is almost no infrastructure in the U.S. to develop and implement this technology. This includes training and education.

Techniques in design, manufacturability, and cost of manufacturing and performance issues must be studied and become a part of the law of this field which, historically, has been a scientific curiosity.

Thank you.

[The statement follows:]

COUNCIL on SUPERCONDUCTIVITY for AMERICAN COMPETITIVENESS
1050 Thomas Jefferson Street, N.W. • 6th Floor • Washington, DC 20007 • 202 965-4070

STATEMENT

OF THE

COUNCIL ON SUPERCONDUCTIVITY
FOR AMERICAN COMPETITIVENESS

BEFORE THE

UNITED STATES SENATE
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

25 JULY 1989

Good morning Mr. Chairman and members of the committee. My name is Tom Long and I am Vice-President of the Technology Group at Tektronix, Inc. in Beaverton, Oregon. Tektronix is a $1.4 billion corporation established in 1946. We are a leading manufacturer of electronic products and systems in the areas of testing and measurement, computer graphics, and communications. Tektronix is now becoming increasingly involved in the applications of superconductivity to commercial products. I am appearing before you today as a member of the Board of Directors of the Council on Superconductivity for American Competitiveness, known as CSAC. CSAC is a non-profit trade group formed in 1987 and is concerned with America's relative global posture with regard to capitalizing on the exciting emerging technology of superconductivity. CSAC has evolved into the only national trade association addressing superconductivity in its commercial context. The CSAC membership is comprised of small businesses,

diversified corporations, entrepreneurial companies, universities and interested individuals. CSAC membership is limited to American citizens and U.S. owned and controlled entities. With that introduction, I will tell you that I would like to cover three areas in my testimony today: The importance of superconductivity to the future; the challenges we face in commercializing this technology, and finally how S. 1191 can help further national technology goals.

THE SUPERCONDUCTOR

Superconductivity is the remarkable ability of certain materials to conduct direct electrical current with no resistance. It is the perfect energy transmission medium. Nothing else in nature can perform this feat. Besides zero-resistance, the other hallmark of superconductivity is the so-called Meissner effect -- the levitation principle based on a superconductor's sensitivity to and repulsion of extraneous magnetic fields. It is the Meissner effect you see pictured in television ads and print journals -- a magnet hovering in mid-air over a chilled ceramic superconductor. These two features of superconductors -- resistance-free energy transmission and magnetic properties including levitation, are the result of the novel quantum nature of superconductivity, found nowhere else in nature. These properties give rise to the wild device concepts

we are prone to conjure in our imaginations.

THE APPLICATIONS -- PRESENT

There is one application of superconductivity in use today that does not have to be conjured up -- it's here -- it is the Magnetic Resonance Imaging machine or "MRI." It is the only large scale commercial application in use today. MRIs are used in hospitals as diagnostic machines. MRI's utilize powerful superconducting magnets, which enable them to provide three dimensional images of human tissue without surgery or patient exposure to radiation. This non-intrusive manner of making medical diagnoses has been a career-extender to many professional athletes with damaged knees, and many a cancer patient who could not otherwise survive exploratory surgery or exposure to massive amounts of X-rays. MRI's are also a God-send to neurologists. With pinpoint accuracy they can locate the smallest of tumors, making for quicker, more exact surgeries.

Commercial MRI's have only been available since 1984, having grown from an annual 100 million dollar business to a 1 billion dollar market in just 5 years. Two companies represented on the CSAC Board, General Electric Company and Intermagnetics General Corporation dominate the commercial market. I cite the MRI experience, Mr. Chairman, to demonstrate the economic and

societal benefits of only one application of superconductivity. Other possibilities are seemingly endless.

THE APPLICATIONS -- FUTURE

To say that MRI's are the tip of the commercial superconductor iceberg, however, is an understatement. Possibilities for commercial products abound -- frictionless motors, magnetic rocket launchers, compact supercomputers, electrical storage systems, flying trains, smart electric cars, and new frontiers in communications technologies and computer input devices spring to mind. And these are only the applications based on our pre-conceived notions -- there are undoubtedly hundreds of others. Perhaps the best parallel here is the discovery of the laser. Who would have dreamed back in 1960 that the laser would have the diversity to factor into national security, cinematic special effects, CD players, and the treatment of cataracts and birthmarks -- to name a few applications. The same analogy holds true for superconductors-- we simply can't predict most of the applications.

SUPERCONDUCTIVITY IN THE UNITED STATES AND JAPAN

As mentioned earlier, CSAC was formed in response to the opportunities presented by superconductivity -- commercial

opportunities that if captured by America could yield tremendous positive results for this country's industrial technology and economic base. As you may have guessed, the international competition to dominate in this arena is intense. The Japanese have mounted an organized and well funded pre-commercial effort evidenced by their consortium of 101 companies known as "ISTEC" (the International Superconductivity Technology Center) -- 100 scientists under one roof in Tokyo, all under the age of 35, singularly investigating every theoretical and practical nook and cranny of superconducting materials.

While the Japanese can be characterized as confidently moving forward, the American effort may be characterized as "wait-and-see." Neither approach can be termed "right" or "wrong", but historically America has been pre-empted in commercial developments employing new technolgies and inventions by adopting this marginally aggressive, short-term mind-set. I need not tell you, Mr. Chairman, that America manufactures and sells very few VCR's, televisions or FAX machines. We depend upon Japanese and other foreign sources for many key components in commercial products and articles of national defense, such as the DRAM semiconductor.

So the question CSAC now poses to America is a simple one: Can we position ourselves early enough to be a successful

commercial player in the superconductor market? CSAC is working to answer that question in the affirmative. Our first focus at CSAC has been to find a way to produce a superconducting product with substantial market potential in the shortest time possible. This is why CSAC has begun to focus on developing a superconducting micro-electronic computing device.

EXPLOITING SUPERCONDUCTIVITY IN ELECTRONICS -- THE 1ST CHALLENGE

Let me now tell you why superconductivity is important in the electronics field -- specifically within digital computing machines. I would emphasize that by highlighting superconducting electronics, we are not relegating any other applications to a lesser level of importance -- it is simply that given the current state of superconductivity technology development, it is very likely that electronics hold the next promise of true commercial-style applications and that rapid commercialization will create an infrastructure in this country to develop other superconductor applications, both large scale and small scale.

THE SUPERCONDUCTING COMPUTER

The computer of the future will have to be smaller, faster, quieter, higher frequency, more sensitive, more energy efficient and in short, better than ever before. The information age

demands it. The fastest, quietest, lowest power, highest frequency electronic circuits in the world are superconducting circuits. The replacement of the vacuum tube by the transistor produced what we now call the Information Age. The utilization of superconductors in electronics is likely to produce another "Age" in the areas of communications and computers. The control of this leading new information age technology could mean the control of our economic future. Thus, the information age is evolving before our eyes, and superconductivity will play a key role.

The most obvious advantage of superconducting circuits is an easy one to grasp -- they will allow for smaller computers. If this seems simplistic to you, that's good, because it is a simple principle to grasp. Why? Because we are rapidly approaching the physical limit for device performance for manufacturable microelectronics. One way to make computers faster is to use devices that naturally operate faster, like superconducting devices.

Another way to speed data processing is to make the machines smaller, to minimize the time it takes for the information to travel around the machine. We can't do that now because present circuitry produces too much heat to be packed closely. But remember now that superconductors operate on a different physical

principle and produce almost no heat in operation. You could therefore "dense pack" superconducting circuity to produce a smaller, faster, more powerful computer. This is but one of the benefits of the superconducting micro-circuit -- there are others -- but just let it be said that superconductors may be the technological leap forward that is needed for the next generation of computers, because as you begin to exploit the quantum properties of superconductors within digital computing devices, hard-to-imagine speeds and a manifold increase in functions are enabled, opening up a new world of real-time data processing.

HANDWRITING ON THE WALL: THE JAPANESE EFFORT IN Sc ELECTRONICS

A concerted effort in Japan is now underway that may make the superconducting supercomputer a reality in the 1990's. Such a machine will outperform any computer now on the drawing boards. I need not remind this committee that American computer manufacturers are approaching the $100 billion mark in annual sales. It is important that the United States retain and expand its share of the market. Retaining this share depends upon keeping pace with and developing new products. IBM abandoned its own superconducting supercomputer effort back in 1983. The Japanese, however, have continued their pursuit of the superconducting supercomputer. CSAC has published reports that tell us that Japan has recently formed a six-member electronics

consortium, funded at $800 million (U.S.) through Japan's Agency for Industrial Science and Technology. The companies receiving 10-year research grants are Japan's electronic giants -- Nippon Electric, Toshiba, Hitachi, Fujitsu, Oki Electric and Sanyo. Portions of the research will be carried on by ISTEC, the consortium I mentioned earlier, which is being led by Japan's respected techno-guru, Dr. Shoji Tanaka, the pioneer of Japan's semiconductor and fiber-optics industry. By all accounts, Japan's posture is far-removed from a "wait-and see" attitude.

CSAC officials have also recently visited Japanese laboratories and learned that at least one Japanese company has a prototype device that is a 1.1 GHz superconducting processor that contains 24,000 Josephson junctions and integrates a 4-bit microprocessor with a multiplier, an accumulator and 8 kilobytes of program memory, all on the same chip. With this achievement, the hardware portion of a basic superconducting computing engine is essentially finished. Along the same lines, Hitachi and Fujitsu have demonstrated prototype superconducting microprocessors that are more than 10 times faster than their gallium-arsenide equivalents. Even more startling performance improvements can be expected in later Japanese prototypes.

Mr. Chairman, the handwriting is on the wall with respect to superconducting electronics. We need to recognize that fact in

this country and react, if not pre-empt. This is why we ar proposing a CSAC spawned organization known as the SuperChip Corporation.

SUPERCHIP -- A NOVEL U.S. APPROACH

With this background, CSAC has determined that an overarching American superconductivity electronics effort is essential to our U.S. long-term competitive posture. CSAC's answer to the challenge is a for-profit corporation known as the SuperChip Corporation. SuperChip was incorporated in 1988. Presently, my company, Tektronix, has committed to becoming a shareholder in the corporation. Other companies are to follow suit in the next few weeks. In a nutshell, SuperChip will be an entity that will seek to accelerate the use of superconductors in digital micro-electronic devices. It is a device-driven, product oriented for-profit effort.

As presently conceived, SuperChip will seek government support through the sale of federally guaranteed bonds. This will allow us to leverage the contributions and capital of the private participants. Through the sale of product, SuperChip would retire the government-backed debt, ultimately phasing out government participation.

The Corporation will seek legislation to secure the necessary financial and non-financial leverage to acomplish its objectives and create the necessary superconductivity infrastructure from which other superconducting efforts could spring -- including anti-trust exceptions for joint production ventures, and process patent protections.

Recognizing the need and potential of an organization such as SuperChip, the Pentagon's Defense Advanced Research Projects Agency (DARPA) has given us a head-start on this project, by awarding CSAC a $588,000 study grant to narrow down and simulate the manufacturable device concepts that a consortium like SuperChip may wish to pursue. Therefore, in a year's time, we will have a much better grasp and focus on the promise of superconducting electronic devices, and how to proceed with the task of producing them.

Mr. Chairman, I would conclude this portion of the discussions by saying that we are in the process of beginning to plant the seeds of the SuperChip concept within the Administration and the Congress. The staff and members of this committee will hear more about the Superchip proposal in the coming weeks. A SuperChip summary description "white paper" has been made available to the committee's staff. This brings me to my closing remarks, and my comments on the S. 1191 legislation.

S. 1191: THE TECHNOLOGY ADMINISTRATION AUTHORIZATION ACT

Mr. Chairman, speaking for Tektronix and the corporate members of CSAC, we are in support of the principles behind your bill, S. 1191. As you have pointed out, America's eroding technology base is a mixed-bag of problems -- capital costs, education, trade policy, human resources and technology development. The Technology Administration Authorization Act (S. 1191) addresses the technology issue head on. This bill proposes innovative federal solutions to a long-term problem--how to mitigate the risks of the private sector in entering into nascent technology R&D efforts such that we can posture ourselves to compete in the long-term. This problem is addressed in the portion of the bill that is called the Advanced Technology Program.

You state the case clearly in your June 15 remarks in the Congressional Record: "the federal government has a role and a responsibility to help speed the development of basic new technology." In answer to this, your bill authorizes federal seed money for one or more industry consortia in advanced electronics, superconductivity, advanced manufacturing, and x-ray lithography. We applaud this proposal -- it is an early indication of both concern and leadership on the part of the U.S. Congress in solving brewing technological crises. This

proposal, in increasing the role of the U.S. Department of Commerce in accelerating commercial technology afforts, is an excellent adjunct to some of the fine and forward-thinking "dual-use" contracting being performed at DARPA, especially in the arena of high-temperature superconductivity. Also impressive are the efforts underway at the Department of Energy, especially at the National Laboratory Superconductivity Pilot Centers at Los Alamos, Oak Ridge and Argonne. Other important programs are being carried forward under the DOE, notably in the Office of Renewable Energy.

It is also CSAC's hope that the White House Office of Science and Technology Policy can also complete deliberations tied to a 5-Year Superconductivity Action Plan and a statutorily required report by the National Commission on Superconductivity. All these activities will lend credence to the importance of superconductivity in our national technological development picture. Coordinating the role of government in addressing technological issues is of primary concern to CSAC. We look forward to working with you and your staff to ensure passage of S. 1191 and to promote other ideas that will further enhance the ideals of technology competitiveness -- including the role of SuperChip as part of a national technology agenda.

CONCLUSION

Mr. Chairman, there is very likely a major technological revolution just down the road, and a minor one already occurring -- it's called the age of the superconductor. My testimony to the committee today outlines some novel approaches CSAC is undertaking to put America in a position to capitalize on the commercialization of superconducting electronic devices. I have also made the committee aware of the intense commitment by the Japanese, both in terms of money and human resources, in mounting pre-commercial programs in superconductivity. I reiterated the views of many on this panel that America must find a way to integrate the resources and talents of government in assisting the private sector in the high-risk process of investigating and developing unproven technologies. I pointed out that S. 1191 recognizes flaws in the system and poses solutions. Nonetheless, naysayers will decry the S. 1191 authorization of new NIST funds in a time of deficits as being premature or unwise. Conversely, other critics will charge that the bill "just doesn't go far enough."

For all those critics, I am compelled to relate a story from a recent book by James Fallows. In the context of discussing America's role in the world economy, as this story goes, a gentleman asks an internationally experienced American

businessman: "Do you think we need to learn how to be more like the Japanese?" The American replies: "Hell, no, we need to be more like us." More Like Us is the title of the book. Mr. Chairman, CSAC looks forward to working with you and this committee, and the government as a whole, in proposing novel programs that will make us "more like us." S. 1191 is a step in that direction. CSAC looks forward to working with the members and the staff of the committee to insure a beneficial outcome to your deliberations on S. 1191.

Thank you. I will be happy to answer your questions.

The CHAIRMAN. Thank you very much.
Dr. McTague.

STATEMENT OF DR. JOHN P. McTAGUE, VICE PRESIDENT, RESEARCH, FORD MOTOR CO.

Dr. McTAGUE. Thank you, Senator.

I am pleased to appear before this Committee to present my personal views on the Technology Administration Authorization Act of 1989.

I will be speaking today from the perspective of a private sector research and development manager, an observer and participant in Federal science and technology policy-making, and as a customer and adviser for the Technology Administration's National Institute for Standards and Technology.

Currently, I am Vice President for Research at Ford Motor company. Prior to that, I served as both the Deputy Director and Acting Director of the Office of Science and Technology Policy in the Executive Office of the President, and as the Director of the National Synchrotron Light Source at Brookhaven National Laboratory.

My company is a long-time customer for the research and services of the National Institute of Standards and Technology,the jewel of the Technology Administration. Indeed, NIST is a national jewel.

At present, I am a member of the NIST Visiting Committee on Advanced Technology, and before that I was a member of a panel of the National Research Council's Board on Assessment of NIST Programs.

In sum, I have spent nearly 25 years in carrying out research, teaching, formulating national science and technology policy, and managing research and technology applications.

Let me begin by saying that I applaud and support efforts to enhance the role of the Department of Commerce in being a partner and supporter of U.S. industrial technology and in participating in the evolution of civilian technology policy.

The department is well positioned to take an even more substantial role in this area, especially in light of the new assignments given to the National Institute for Standards and Technology.

I also applaud the efforts of this Committee and its House counterpart in attempting to support and enhance the research services and outreach programs of the National Institute of Standards and Technology.

NIST is extremely effective at contributing to and indeed providing essential components of the technical base of U.S industry, the technical base on which industry relies.

It is the only laboratory of its kind in the country, even the world.

For some time, NIST has been under-funded. Regardless of which yardstick is used to assess the appropriate level for NIST funding, the same conclusion is reached: a serious deficiency exists.

Science and technology are commonly recognized as central elements in U.S. economic competitiveness and national security. In the last 15 years, the U.S. Gross National Product has shown real growth of more than 50 percent. In that same period, U.S. industry has increased its research and development funding by more than 80 percent in constant dollars.

Federal R&D spending has had real growth of more than 50 percent over the same period. Both industry and government have made this investment because our national economic strength and our national security have relied more and more heavily on technology.

NIST, which targets its research and services on the most important elements of our industrial R&D, and which supports the entire economy, has had zero—zero—real growth over those years.

In rough terms, the NIST budget would have to be doubled to be equivalent with the R&D spending of its primary customers.

I want to make clear at this point that when I talk about doubling the NIST budget, I am referring to its in-house laboratory based research and services. The first priority is to provide NIST with the resources required to allow it to continue to be a world class laboratory in support of U.S. industry and government.

This research base must be strong enough to support all of the other proposals for extended and expanded missions, or those new missions will surely crush the very capability which led policy-makers to establish NIST in the first place.

The new programs assigned to NIST by the Technology Competitive Act of 1988 address problems of national concern. It is well acknowledged that we are good in science and generic technology, but poor in transitioning into manufacturing processes and products.

Most of the responsibility for improving this technology transfer lies clearly at the feet of industry. For several years, we, as a Nation, have been debating how to improve this process. But no one that I know of has come up with a magic solution.

We often get sidetracked on philosophical debates, on whether and what form a Nadional Industrial Policy should take.

I want to dismiss that issue here today. The central point is that, even if we wanted an industrial policy, we just do not know what would work in any case.

Rather than discussing industrial policy, we should be evolving a National Technology Policy. I don't know exactly what that policy should encompass, but there are two clear principles.

The first is that government and the private sector should not view each other as adversaries with opposing goals. Second is that, in view of the uncertainty about how to proceed, we should have a policy of experimentation.

We already have several experiments in progress. On the government side, the National Science Foundation has operated a university/industry cooperative research program for more than ten years, and, more recently, has created a set of engineering research centers.

In the private sector, there are a number of experiments, ranging from private corporations, such as the Semiconductor Research Corporation, in which the government participates, to purely private, cooperative R&D ventures, such as the one my company, Ford, along with General Motors and Chrysler have recently formed, the Structural Composites Consortium.

The most prominent joint government/industry experiment currently underway is SEMATECH, but a number of other joint efforts are under discussion.

As a researcher, I am used to risk taking, and I think that these new programs deserve taking a risk. On the other hand, the ideas embodied in these new programs are experimental and should be treated that way.

This means, number one, do not undertake them at the expense of programs, such as NIST research and services, which have proven critical importance to American industry.

Secondly, do not institutionalize these new programs in a rigid way, and do not make them extremely big and expensive until they have been tried in a more experimental mode.

The concept of building on the strength of the National Institute of Standards and Technology and technology transfer to assist U.S. industry and State and local governments in improving our international competitiveness is appealing.

For example, the regional centers for the transfer of manufacturing technology, the only portion of four new major assignments that has been funded, seems to be a sound concept and the NIST plan for implementing these centers is reasonable.

NIST's plan to emphasize hands-on experience in these centers in a partnership with academic institutions, particularly community colleges and vocational schools, to train workers for automated manufacturing firms, seems particularly appropriate.

The institute is also well qualified and positioned to carry out the other assignments described in the Technology Competitiveness Act—Industrial Extension Services and the Advanced Technology Program.

The Industrial Extension Services Program intends to make Federal technology available to small and mid-sized businesses by having NIST provide technical assistance to existing State and local extension entities.

Because of its long-standing cooperative mode of working with industry and with other Federal and State agencies, and, more recently, working very closely and successfully with State and local extension programs and its energy-related inventions program, NIST has extensive experience and capability that makes it an appropriate leader for carrying out such a national program.

Even though the assignments related to the Advanced Technology Program would be a relatively new venture for NIST, NIST's technical competence, its unquestioned integrity, and its extensive knowledge of and interactions with industry, universities, and government, make it a natural choice for formulating, starting up and operating this new program.

I am less supportive of having NIST carry out provisions related to loan guarantees. These provisions would carry NIST away from its strengths—hands-on, cooperative, laboratory-based research—and toward areas that might potentially damage the institution—highly politicized decisions about markets and returns on investments.

In summary, Mr. Chairman, let me reiterate that, first, I believe that the NIST core program is a national jewel on which industry justifiably relies.

The first priority of this Committee should be to support the NIST base program at a level substantially higher than it has been supported in recent years.

Second, I believe that the expansion and the extension of the NIST mission into technology transfer and more general support for civilian industrial technology development are worth attempting on an experimental mode. However, any new NIST assignments must also be accompanied by adequate, new resources.

Thank you for the opportunity to appear before you this morning.

The CHAIRMAN. Thank you very much.

Mr. Resor.

STATEMENT OF GRIFFITH RESOR, PRESIDENT, MRS TECHNOLOGY, REPRESENTING THE AMERICAN ELECTRONICS ASSOCIATION

Mr. RESOR. Thank you, Mr. Chairman and Members of the Committee. Thank you for your invitation to testify this morning.

I appear before you today representing the American Electronics Association, or the AEA, as we call it.

In addition to having been a member of the AEA ATV Task Force last year, I am founder and President of MRS Technology, Inc.

MRS is a venture funded company in the Boston area. Our expertise is in manufacturing equipment for the manufacture of flat panel displays. I should add that I have been in the business of making manufacturing equipment for the IC industry since 1965.

My first experience, like Tom Murrin's, with the Japanese was at that time.

The problem in the electronics industry is that the industry is no longer driven simply by space and computer technologies. Our foreign competitors have demonstrated that consumer electronics are moving to digital technology and, as a result, can now drive major segments of the industry.

Past examples are VCRs, compact discs, digital audio tapes, and your phone system.

High definition television, in whatever form it takes, will be a future example.

Consumer segments of the industry are very important because they offer economies of scale far in excess of what you find in the other segments. It is possible to be number five or six in the television business and still have a unit volume in displays that exceeds the volume that IBM would have.

As you know, in these types of processes, volume is often the key to low cost and competitive position.

By not playing in the consumer electronics segments, the U.S.-based electronics industry will not enjoy the strategic advantages that come from being connected to these new drivers. This, in my view, is a serious structural problem in the U.S. electronics industry.

It is a major cause of our Nation's trade problems, and I believe it is a major cause of the decline in our semiconductor business.

Some people, particularly here in Washington, ask do we care. Not only does the electronics industry care, I believe we should care as a Nation.

The Twenty-First Century will be the Information Age. Nations that develop tools for competition in this age will provide the best standards of living for their citizens. The electronics industry clearly will play a central role in this competition.

Our Nation's defense depends on electronic superiority. We must maintain a superior competitive electronics industry in both sectors.

This Committee's focus on strengthening this role rightly recognizes the seriousness of the commercial needs. DARPA's focus on HDTV rightly recognizes the seriousness of the military needs.

Japan and Europe have already recognized this potential and have funded their strategic thrust.

I brought with me, if you would allow me a quick diversion, a sample of this new display technology, which I will start up and pass around.

This (indicating) is a Hitachi five inch portable television. The on switch is so small that I can't find it.

We were not sure how good the reception would be here in the building, but it is adequate. If you get it connected with a direct video feed, the picture quality is competitive with television.

There is a small button in the upper corner on the left (indicating). If you push that button when you get this, the TV opens up. The entire television screen is this one-quarter inch thick device. It is an active

matrix liquid crystal display that controls the transmission of light and includes the color.

When you put it back down, after a moment the light bulb behind it will light back up. It is a fluorescent light bulb in a plastic block. It is not very complicated technology.

You can purchase this in Japan for about $700.

The CHAIRMAN. How much is it in the United States?

Mr. RESOR. I'm not sure you can purchase them in the United States with this large a screen. The Sony Watchman includes a three inch screen.

The CHAIRMAN. I'll make a side bet with you. I don't know if what I'm saying is fact, but I am just willing to gamble—I'll bet you you can buy it in the United States and I'll bet you can buy it for substantially less. We have actually first witnessed this in the dumping cases.

Go ahead.

Mr. RESOR. I agree with you completely. It is just not marketed yet. That is my only reservation.

The CHAIRMAN. Oh, I see.

Mr. RESOR. This display technology involves giant integrated circuits fabricated on a piece of glass. A part of what I am involved in is transferring the manufacturing technology that has been developed in ICs to a whole host of what I call "low tech" electronic products.

The Japanese have dubbed this technology trend "Giant Electronics," and it is being paid for largely by consumer product dollars.

To summarize this part of my testimony, I believe it is time that the NIST and DARPA programs get funded and that we get on with this, as other people have said this morning.

We do have three specific points to make about the current legislation, and these are in my written testimony. I would just like to highlight a little bit of that.

The AEA has tried to respond to this "opportunity," as I call it.

Another aside—the Japanese and Chinese characters for "crisis" are two characters. One is "opportunity;" the other is "danger." Many talks that I have given use that.

The AEA formed a task force to study this problem in 1988. The task force identified the structural issues that I have just described. It also saw HDTV as the best vehicle this country could choose to correct these problems.

In 1989, the AEA acted as an industry catalyst to bring 36 companies together to fund the Boston Consulting Group. BCG called on 95 companies in television and related businesses on three continents. Their key findings are included on page 5 of my written testimony, and their recommended six point program is given on page 6.

Three points relate to the bill that you are considering today.

We support the authorization of seed money for an advanced electronics ATV effort in S. 1191. This would provide the help industry critically needs to tackle these infrastructure deficiencies.

We also support the creation of an Advanced Electronics Advisory Board for developing a plan for research and development in advanced electronics ATV. As we have already heard this morning, it is not at all clear exactly how to put this program together, and I think an advisory board is a good idea.

This is certainly a step in the right direction, and AEA looks forward to working with the people on this Committee to enhance the board's position and role and provide specifics as to its composition and authority.

My final point involves foreign participation.

The AEA strongly urges the Committee to reconsider this portion of the bill, particularly the restrictions on licensing arrangements with foreign companies and their subsidiaries. The statistics on patent filings clearly indicate that foreign firms are developing strong patent positions in new technologies. Cross licensing of inventions will be a necessary fact of life in our new global economy.

In many consumer electronics areas, the U.S. industry is now behind its foreign competition. Licensing and joint participation may be the best way to rebuild our domestic capability.

As we have seen in other industries, foreign-based firms often bring new ways of operating that strengthen our domestic business in the long run.

The U.S. does not have a monopoly on good ideas or good business practice. The AEA would like to work with the Committee to develop alternative, constructive guidelines included in the legislation for working with foreign companies and to promote the enactment of what is a critically needed and timely bill.

Thank you.

[The statement follows:]

STATEMENT OF GRIFFITH RESOR ON BEHALF OF THE AMERICAN ELECTRONICS ASSOCIATION

MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE, THANK YOU FOR YOUR INVITATION TO TESTIFY ON THE ROLE THE TECHNOLOGY ADMINISTRATION AND NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY SHOULD PLAY IN STRENGTHENING U.S. CIVILIAN TECHNOLOGY BASE IN AREAS SUCH AS ADVANCED ELECTRONICS, INCLUDING ADVANCED TELEVISION (ATV).

I APPEAR BEFORE YOU TODAY REPRESENTING THE AMERICAN ELECTRONICS ASSOCIATION (AEA). AEA IS A 46 YEAR OLD NATIONAL NON-PROFIT TRADE ASSOCIATION OF SOME 3,500 COMPANIES AND 45 U.S. ENGINEERING UNIVERSITIES. ITS MEMBERS DESIGN, MANUFACTURE OR CONDUCT RESEARCH IN ELECTRONICS, ELECTRONIC COMPONENTS, AND RELATED INFORMATION TECHNOLOGY PRODUCTS.

IN ADDITION TO BEING A MEMBER OF AEA'S ORIGINAL HDTV TASK FORCE, I HAVE BEEN PRESIDENT OF MRS TECHNOLOGY, INC. SINCE I HELPED START THE COMPANY IN 1986.

MRS TECHNOLOGY, INC., WHICH IS BASED IN CHELMSFORD, MASSACHUSETTS, HAS DESIGNED AND NOW MANUFACTURES THE MODEL 4500 "PANELPRINTER". THIS IS THE FIRST PRODUCTION LITHOGRAPHY SYSTEM SPECIFICALLY DESIGNED FOR HIGH VOLUME MANUFACTURE OF ACTIVE MATRIX LIQUID CRYSTAL FLAT PANEL DISPLAYS AND OTHER LARGE AREA SEMICONDUCTOR DEVICES.

NIST

THIS COMMITTEE IS TO BE COMMENDED FOR ITS LEADERSHIP IN HELPING CONGRESS RECOGNIZE AND RESPOND TO THE NEED TO IMPROVE THE U.S. MANUFACTURING BASE AND SPEED COMMERCIALIZATION OF TECHNOLOGY BY CREATING NIST. AEA SUPPORTS A SIGNIFICANT INCREASE IN NIST'S BUDGET TO SUPPORT ITS EXPANDED RESPONSIBILITIES. WE ARE DISMAYED AT THE ADMINISTRATION'S INITIAL DECISION TO PROVIDE NO NEW FUNDS IN FISCAL YEAR 1990 FOR NIST'S NEW TECHNOLOGY TRANSFER PROGRAMS.

THE INSTITUTE'S MISSION OF IMPROVING QUALITY, MODERNIZING MANUFACTURING PROCESSES, AND FACILITATING THE TRANSFER AND COMMERCIALIZATION OF EMERGING TECHNOLOGIES RESPONDS TO A CRITICAL NEED TO REVERSE THE EROSION OF OUR CIVILIAN TECHNOLOGY BASE. S. 1191, THE TECHNOLOGY ADMINISTRATION AUTHORIZATION ACT, APPROPRIATELY BUILDS ON THIS MANDATE TO FOSTER GOVERNMENT/INDUSTRY JOINT EFFORTS AIMED AT DEVELOPING CRITICAL BASIC TECHNOLOGIES THAT WILL ENABLE OUR COUNTRY TO PARTICIPATE IN NEW INDUSTRIES.

ADVANCED ELECTRONICS, AND SPECIFICALLY ADVANCED TELEVISION, HAS BEEN CORRECTLY IDENTIFIED IN THIS LEGISLATION AS CRITICAL EMERGING TECHNOLOGIES THAT WILL HAVE A SIGNIFICANT IMPACT ON THE LONG-TERM ECONOMIC HEALTH AND COMPETITIVENESS OF THE U.S. NIST, UNDER THE LEADERSHIP OF THE DEPARTMENT OF COMMERCE AND ITS TECHNOLOGY ADMINISTRATION, SHOULD PLAY A FEDERAL LEADING ROLE IN SUPPORTING INDUSTRY-LED EFFORTS TO DEVELOP AND COMMERCIALIZE ATV TECHNOLOGIES.

THE DIRECTION AND FUNDING PROVIDED IN S. 1191, WOULD ENABLE NIST AND ITS ADVANCED TECHNOLOGY PROGRAM TO SERVE AS THE MUCH-NEEDED CIVILIAN COUNTERPART TO DARPA, PROVIDING SUPPORT FOR INDUSTRIAL ATV TECHNOLOGY AND PRODUCT AND PRODUCTION PROCESS DEVELOPMENT, AND THE BUILDING AND TESTING OF PROTOTYPE INTERCHANGE STANDARDS AND TRANSMISSION SYSTEMS. S. 1191 WOULD ENABLE NIST TO ALSO SERVE AS A CATALYST IN LAYING THE GROUNDWORK FOR U.S. PARTICIPATION IN ATV - A CRITICAL EMERGING TECHNOLOGY THAT WILL HAVE A SIGNIFICANT IMPACT ON THE LONG-TERM ECONOMIC HEALTH AND COMPETITIVENESS OF THE U.S.

DARPA

AEA APPLAUD'S DARPA'S LEADERSHIP IN COMMITTING $10 MILLION A YEAR FOR THREE YEARS FOR ATV-RELATED DEFENSE R&D AND MAKING FIVE ATV RESEARCH AWARDS. DARPA'S MODEST ATV SOLICITATION, HOWEVER, BROUGHT OVER 80 ATV R&D PROPOSALS, AND 44 OUTSTANDING PROPOSALS NOW REMAIN UNFUNDED. THIS CLEARLY DEMONSTRATES THE EXTENT OF INDUSTRY INTEREST IN ATV AND THE ABILITY OF GOVERNMENT TO SERVE AS A CATALYST IN STIMULATING INDUSTRY ACTION.

UNFORTUNATELY, DARPA DOES NOT CURRENTLY HAVE THE NECESSARY FUNDS TO TAKE ADVANTAGE OF INDUSTRY'S COMMITMENT TO MATCH ON AVERAGE OF AT DOLLAR FOR DOLLAR UP TO $100 MILLION OF DARPA FUNDING FOR THESE CUTTING-EDGE R&D PROPOSALS. GIVEN THE IMPORTANCE OF ATV BOTH TO OUR NATION'S DEFENSE AND OUR INDUSTRIAL BASE, AND THE RISK THAT THESE UN-FUNDED PROPOSALS MAY BE SEIZED BY FOREIGN COMPETITORS, AEA STRONGLY URGES THE SENATORS TO SUPPORT $100 MILLION IN FY 1990 FOR DARPA ATV FUNDING. ALONG WITH AEA'S SUPPORT FOR SUBSTANTIAL INCREASES IN DARPA'S ATV BUDGET, COMES A REQUEST THAT DARPA AND NIST COORDINATE THEIR EFFORTS IN THOSE AREAS, SUCH AS ATV, WHERE THERE IS BOTH ECONOMIC AND MILITARY IMPACT.

STRATEGIC IMPORTANCE OF ATV

AEA HAS SINGLED OUT ATV FOR SUPPORT BY BOTH DARPA AND NIST BECAUSE IT IS A CRITICAL EMERGING TECHNOLOGY THAT WILL HAVE SIGNIFICANT IMPACT ON THE LONG-TERM HEALTH AND COMPETITIVENESS OF THE U.S.

ATV -- THE NEXT GENERATION OF VIDEO PRODUCTS -- WILL COMBINE THE VOLUME OF A CONSUMER BUSINESS WITH MUCH OF THE TECHNICAL SOPHISTICATION OF PROFESSIONAL ELECTRONICS. ATV PRODUCTS WILL HAVE STRONG TECHNOLOGY AND ENGINEERING/MANUFACTURING LINKS TO COMPUTER WORKSTATIONS AND BROAD RANGE OF OTHER HIGH-RESOLUTION IMAGING BUSINESSES, AND WILL BE A MAJOR END-USE MARKET FOR SOPHISTICATED INTEGRATED CIRCUITS (ICs). IF THE U.S. ELECTRONICS INDUSTRY DOES NOT DEVELOP A STRONG TECHNOLOGY, ENGINEERING/MANUFACTURING INFRASTRUCTURE, AND VOLUME POSITION IN ATV PRODUCTS AND COMPONENTS, ITS COMPETITIVE POSITION IN COMMERCIAL (I.E., NON-CONSUMER) ELECTRONICS WILL BE UNDERMINED.

ALTHOUGH THE ATV PRODUCTS WILL NOT BECOME A MAJOR MARKET UNTIL AFTER THE YEAR 2000, THE INVESTMENTS MADE IN THE 1990s WILL DETERMINE WHO CONTROLS THE MARKET IN THE FOLLOWING DECADE.

THE ATV INDUSTRY WILL HAVE AN IMPACT ON COMMERCIAL ELECTRONICS FOR FOUR REASONS:

o KEY COMPONENTS OF ATVs (HIGH-RESOLUTION COLOR DISPLAYS AND VIDEO MEMORIES), WHICH MAKE UP ABOUT 50 PERCENT OF DIRECT COST, ARE ALSO KEY COMPONENTS OF ENGINEERING WORKSTATIONS AND HIGH-END PERSONAL COMPUTERS.

o MANUFACTURING TECHNIQUES AND EQUIPMENT FOR SURFACE-MOUNT PRINTED CIRCUIT BOARDS AND SYSTEM FINAL ASSEMBLY WILL BE SHARED BY ATVs AND COMPUTERS.

o THE TIGHT ENGINEERING/MANUFACTURING LINKS THAT ENABLE FAST PRODUCT DEVELOPMENT, WHICH WERE LARGELY PIONEERED BY CONSUMER ELECTRONICS COMPANIES, ARE INCREASINGLY VITAL FOR COMMERCIAL ELECTRONICS COMPANIES AS LIFE CYCLES FOR MANY COMMERCIAL PRODUCTS SHRINK.

o BEYOND THE YEAR 2000 ATVs WILL BE A LARGE END-USE MARKET FOR ICs AND ESPECIALLY DIGITAL SIGNAL PROCESSING AND VIDEO MEMORY ICs. IF THE U.S. IC INDUSTRY LACKS THIS DOMESTIC MARKET, ITS DESIGN AND PROCESS SKILLS AND CASH FLOW WILL BE WEAKENED IN RELATION TO FOREIGN COMPETITION.

ATV -- LINCHPIN OF ELECTRONICS INDUSTRY

ONE OF AEA'S KEY OBJECTIVES FOR THE ATV STRATEGY IS TO CREATE A TECHNOLOGY BASE AND COMPONENT AND MANUFACTURING INFRASTRUCTURE IN THE U.S. THAT WILL BENEFIT BOTH THE ATV INDUSTRY AND RELATED U.S. INDUSTRIES. KEY ELEMENTS OF THE TECHNOLOGY BASE AND COMPONENT INFRASTRUCTURE ARE DIGITAL SIGNAL PROCESSING (DSP) AND RANDOM ACCESS MEMORY (RAM) INTEGRATED CIRCUITS (ICs), FLAT-PANEL DISPLAYS, ADVANCED HIGH-RESOLUTION CATHODE RAY TUBE (CRT) DISPLAYS, AND ADVANCED VIDEO PROJECTION TECHNOLOGIES (E.G. LIGHT VALVES). KEY ELEMENTS OF THE SYSTEM INFRASTRUCTURE ARE ELECTRONIC AND ELECTROMECHANICAL ASSEMBLY TECHNIQUES AND EQUIPMENT, RAPID PRODUCT DEVELOPMENT TECHNIQUES, AND RAPID AND EFFICIENT TECHNIQUES FOR VENDOR AND MATERIAL MANAGEMENT.

A NUMBER OF CLOSELY-RELATED U.S. INDUSTRIES WILL BENEFIT FROM A STRONG U.S. ATV INDUSTRY AND INFRASTRUCTURE. THESE INCLUDE COMPUTERS (WORKSTATIONS, PERSONAL COMPUTERS, GRAPHICS TERMINALS) THAT USE ATV-LIKE COMPONENTS AND TECHNOLOGY IN THEIR DISPLAYS, MEMORIES, AND IMAGE PROCESSING; SEMICONDUCTORS, FOR WHICH THE ATV INDUSTRY WILL BE A MAJOR MARKET IN THE LATE 1990s AND BEYOND; AND MANY COMMERCIAL/INDUSTRIAL HIGH-RESOLUTION IMAGINING BUSINESSES (E.G. ELECTRONIC PUBLISHING, MEDICAL IMAGING, COMPUTER-ASSISTED ENGINEERING, DRAFTING, MANUFACTURING) THAT DRAW ON THE ATV

COMPONENT AND TECHNOLOGY BASE. IF THE U.S. DOES NOT DEVELOP A STRONG ATV INDUSTRY, THE U.S. POSITION IN THESE RELATED BUSINESSES WILL BE UNDERMINED.

ATV -- FUNDAMENTALLY DIFFERENT

EXPERIENCE OVER THE PAST DECADE IN EUROPE AND JAPAN HAVE BEEN THAT TECHNOLOGIES AND CAPABILITIES TRICKLE UP AS WELL AS TRICKLE DOWN. IN PARTICULAR, THE RAPID RATE OF PRODUCT AND TECHNOLOGY COMMERCIALIZATION AND THE RELENTLESS COST REDUCTIONS IN THE CONSUMER ARENA HAVE ENHANCED COMPANIES', AND THEIR SUPPLIERS', COMPETITIVENESS. HDTV PROMISES TO ACCELERATE THESE PATTERNS. PERHAPS EVEN MORE IMPORTANT IS THE FACT THAT ATV ITSELF IS A FUNDAMENTALLY DIFFERENT PRODUCT FROM OTHERS IN THE CONSUMER FIELD: IT HAS THE TECHNICAL CONTENT OF A COMPUTER OR WORKSTATION, BUT WILL ULTIMATELY HAVE THE HIGH VOLUMES ASSOCIATED WITH CONSUMER ELECTRONICS.

THE U.S. CONSUMER ELECTRONICS INDUSTRY OVERALL IS BEHIND ITS WORLD-CLASS COMPETITION IN JAPAN AND EUROPE. THE U.S.-BASED INDUSTRY HAS RETREATED FROM LOWER-MARGIN PRODUCTS. THE LOW PROFIT LEVELS AND NEED FOR CONTINUAL REINVESTMENT IN THE BUSINESS HAVE LED MANY U.S. HEADQUARTERED COMPANIES TO LEAVE THE TV BUSINESS. U.S.-HEADQUARTERED ELECTRONICS COMPANIES HAVE LARGELY WITHDRAWN FROM CONSUMER ELECTRONICS MARKET, AND SUCCESSFUL ELECTRONICS COMPANIES DECLINE TO ENTER, FOR THE EXPLICITLY STATED REASON THAT THE RETURN ON INVESTMENT AVAILABLE IS BELOW THE COST OF CAPITAL. AND, THE U.S. LACKS LOW-COST HIGHLY AUTOMATED COMPLEXES COMBINING MANAGEMENT, ENGINEERING, AND MANUFACTURING OF HIGH-VALUE-ADDED VIDEO PRODUCTS SUCH AS THOSE YOU FIND OVERSEAS. AND, LAUNCHING THE ATV MARKET IN THE U.S. REQUIRES LONG TIME HORIZONS, AS LARGE INVESTMENTS MUST BE MADE IN THE 1990s, BUT PROFITS WILL NOT LIKELY BE ENJOYED FOR AT LEAST FIVE TO SEVEN YEARS AND PERHAPS NOT BEFORE THE NEXT DECADE.

KEY INGREDIENT: LOW-COST CAPITAL

TO CREATE A COMPETITIVE MANUFACTURING INFRASTRUCTURE FOR ATV PRODUCTS IN THE U.S. AND AVOID FURTHER JOB EXPORT, A SUBSTANTIAL AMOUNT OF LOW-COST CAPITAL MUST BE MADE AVAILABLE. ONCE A WORLD-CLASS INFRASTRUCTURE ("INFRASTRUCTURE" REFERS TO THE ENTIRE SYSTEM OF BASIC RESEARCH, PRODUCT DESIGN AND DEVELOPMENT, AND MATERIALS MANAGEMENT AS WELL AS MANUFACTURING PLANTS AND INDIVIDUAL TECHNOLOGIES) IS IN PLACE, U.S. FIRMS SHOULD BE ABLE TO COMPETE EFFECTIVELY, EARN REASONABLE RETURNS ON ADDITIONAL INVESTMENTS, AND LEVERAGE THEIR INFRASTRUCTURE TO PRODUCE RELATED PRODUCTS SUCH AS WORKSTATION DISPLAYS AND CPUs.

ONE METHOD OF LOWERING THE COST OF CAPITAL FOR U.S. FIRMS -- AND THE ONLY ONE WE HAVE COME UP WITH SO FAR THAT COULD PROVIDE LOW-COST CAPITAL WITHIN THE NECESSARY TIME FRAME -- IS TO HAVE NIST MAKE AVAILABLE LOW-COST LOANS OR, AS S. 1191 AUTHORIZES, LOAN

GUARANTEES, BOTH OF WHICH WOULD BE MATCHED DOLLAR FOR DOLLAR BY INDUSTRY. THIS IS THE OPTION RECOMMENDED BY THE BOSTON CONSULTING GROUP (BCG), WHICH IDENTIFIES GOVERNMENT LOANS AND LOAN GUARANTEES AS NECESSARY TO ATTRACT PARTICIPATION BY U.S. INDUSTRY IN THE ATV MARKET, TO ENABLE INVESTMENTS IN THE U.S., AND TO PROVIDE WORKING CAPITAL ASSISTANCE TO NEW U.S.-BASED ENTRANTS INTO THE ATV MARKET.

THE AEA ATV BUSINESS PLAN GROUP (COMPRISED OF 36 AEA MEMBER COMPANIES) CONTRACTED WITH THE BCG (BCG) TO IDENTIFY A STRATEGY FOR PARTICIPATION BY THE U.S. ECONOMY IN ATV AND ITS PRODUCT SPINOFFS. THIS PLAN IS OFFERED AS A STARTING POINT FOR THE DEBATE OVER AMERICA'S INVOLVEMENT IN ATV TECHNOLOGIES.

THE BCG FOUND THAT BECAUSE OF:

- THE SIZE OF INVESTMENT REQUIRED,
- THE ANTICIPATED MODEST RETURNS UNTIL SOME TEN YEARS OUT,
- THE TIME AND RISK NEEDED TO DEVELOP THE MARKET, AND
- THE FACT THAT JAPAN AND EUROPE ARE SO FAR AHEAD IN ATV TECHNOLOGIES,

MOST U.S. ELECTRONICS FIRMS ARE RELUCTANT TO PARTICIPATE EITHER INDIVIDUALLY OR AS PART OF A COLLECTION OF COMPANIES WITHOUT SERIOUS FINANCIAL RISK REDUCTION. BCG REPORTED, HOWEVER, AND AEA CONCURS, THAT WITH A DECISIVE, INDUSTRY-LED, JOINT INDUSTRY/ GOVERNMENT SUPPORTED STRATEGY, THE U.S. COULD BUILD A STRONG BASE IN ATV AND OTHER HIGH-DEFINITION PRODUCTS AND COMPONENTS.

ATV BUSINESS PLAN

THE BCG BELIEVES THAT A U.S.-BASED ATV INDUSTRY CAN BE ESTABLISHED, WITH WORLD-CLASS ENGINEERING/MANUFACTURING INFRASTRUCTURE FOR VIDEO PRODUCTS AND A HIGH LEVEL OF U.S.-BASED VALUE ADDED AND TECHNOLOGY CONTENT, THROUGH A SIX POINT PROGRAM. THE PROGRAM WOULD PROVIDE ONE-TIME CATCH-UP ASSISTANCE TO THE U.S. INDUSTRY TO REBUILD ITS TECHNOLOGY BASE AND INFRASTRUCTURE. IN ADDITION, IT WILL USE THE ECONOMIC VALUE OF THE TECHNOLOGY UNDERLYING THE BROADCAST STANDARD TO ENCOURAGE LOCATION OF VALUE ADDED AND TECHNOLOGY CONTENT IN THE U.S., AND TO FUND CONTINUING REINVESTMENT IN THE U.S. TECHNOLOGY BASE. WITH THESE STEPS, THE U.S. SHOULD HAVE A FULLY COMPETITIVE, BROAD-BASED VIDEO PRODUCTS INDUSTRY, COMPETING IN AN OPEN MARKET.

THE KEY LEADERSHIP ROLE IN THIS PROGRAM IS PLAYED BY AN INDUSTRY-LED BODY CALLED THE "ATV ADVISORY BOARD" THAT COORDINATES INDUSTRY DEVELOPMENT AND ADMINISTERS ASSISTANCE PROGRAMS ON BEHALF OF THE GOVERNMENT; IT WILL NOT MANUFACTURE OR MARKET ANY PRODUCTS. ALL PRODUCT DEVELOPMENT, PRODUCTION, AND MARKETING WILL OCCUR IN PRIVATE COMPANIES THAT DECIDE, INDIVIDUALLY OR IN ALLIANCES, TO INVEST THEIR OWN FUNDS TO ENTER THE ATV MARKET AND BECOME ELIGIBLE FOR THE ASSISTANCE PROGRAMS; THE GOVERNMENT HAS

NO ROLE IN INITIATING INVESTMENTS OR DESIGNATING WHICH COMPANIES WILL PRODUCE WHICH PRODUCTS.

THE SIX POINTS OF THE PROGRAM ARE:

1. ESTABLISH AN INDUSTRY-MANAGED, GOVERNMENT-SUPPORTED BODY ("ATV ADVISORY BOARD") TO LEAD, COORDINATE, AND MONITOR THE ACTIONS NEEDED TO BUILD AN ATV INDUSTRY IN THE U.S. THE ATV ADVISORY BOARD WILL OTHER COMPANIES DEVELOP ATV-RELATED BUSINESS.

2. MAKE LOWER-COST CAPITAL AVAILABLE TO THE ATV INDUSTRY FOR INVESTMENT IN RESEARCH, INFRASTRUCTURE DEVELOPMENT, AND BUSINESS GROWTH.

3. BUILD WORLD-CLASS INFRASTRUCTURE FOR SYSTEM AND COMPONENT ENGINEERING AND MANUFACTURING FOR ATVs AND OTHER HIGH RESOLUTION IMAGING PRODUCTS.

4. PLUG KEY HOLES IN THE U.S. TECHNOLOGY BASE AND PURSUE BREAKTHROUGH OPPORTUNITIES.

5. SELECT AND ADMINISTER THE BROADCAST AND PROGRAM INTERCHANGE STANDARDS IN A WAY THAT FOSTERS DEVELOPMENT OF THE U.S.-BASED INDUSTRY.

6. MAKE PUMP-PRIMING INVESTMENTS TO SIMULTANEOUSLY BOOST PROGRAM AVAILABILITY AND THE CUSTOMER BASE.

ATV IS A MAJOR MARKET AND TECHNOLOGY CHANGE THAT WILL CREATE OPENINGS FOR NEW STRATEGIES AND NEW ENTRANTS. ESTABLISHING AN ATV BUSINESS WILL BE EXPENSIVE, HOWEVER, AND MAY REQUIRE A LONG TIME HORIZON FOR PAYOFF. JUMP-STARTING THE MARKET WILL REQUIRE CONCERTED ACTION, INVESTMENT, AND LEADERSHIP BY THE EQUIPMENT, PROGRAMMING, AND BROADCASTING INDUSTRIES AND THE INVOLVED GOVERNMENT AGENCIES TO PUT ALL THE SYSTEM ELEMENTS IN PLACE SIMULTANEOUSLY. EUROPE AND JAPAN HAVE WELL ORGANIZED, WELL-FUNDED, GOVERNMENT-SUPPORTED PROGRAMS TO DEVELOP ATV TECHNOLOGY AND JUMP-START THEIR MARKETS.

FOREIGN COMPETITION

DEVELOPMENT OF ATV INDUSTRIES IN EUROPE AND JAPAN WILL OCCUR IN THE 1990s BECAUSE EUROPE AND JAPAN BOTH HAVE STRONG, WELL-ORGANIZED PLANS TO MAKE ATV PROGRAMMING AVAILABLE AND TO PROMOTE (AND IN SOME CASES SUPPORT) THE PURCHASE OF ATV HARDWARE.

NHK, THE JAPANESE NATIONAL BROADCASTING COMPANY, WILL BEGIN BROADCASTING ATV PROGRAMS VIA SATELLITE FOR THREE HOURS PER DAY IN JULY 1989; THE SCHEDULE WILL GRADUALLY INCREASE. A PROGRAM IS PLANNED TO USE JAPAN DEVELOPMENT BANK FUNDS TO FINANCE THE

RECEIVERS FOR SHOWCASE APPLICATIONS, AND THE JAPANESE MANUFACTURERS WILL AGGRESSIVELY DEVELOP SHOWCASE APPLICATIONS IN PUBLIC PLACES. NHK HAS SPENT OVER $500 MILLION ON DEVELOPMENT OF THE JAPANESE ATV TECHNOLOGY AND STANDARDS, AND JAPANESE COMPANIES HAVE SPENT AT LEAST $400 MILLION OF THEIR OWN FUNDS ON PRODUCT DEVELOPMENT.

ANOTHER RELATED JAPANESE EFFORT WORTH NOTING IS THEIR SO-CALLED "GIANT ELECTRONICS" PROGRAM. JAPAN'S MINISTRY OF INTERNATIONAL TRADE AND INDUSTRY (MITI) HAS LAUNCHED A GIANT ELECTRONICS PROGRAM TO DEVELOP VARIOUS FUNDAMENTAL TECHNOLOGIES NEEDED TO REALIZE 1-METER SQUARE DISPLAY CIRCUIT ELEMENTS WITHIN SEVEN YEARS. THESE ULTRA-THIN, LARGE DISPLAY ELEMENTS WILL BE USED IN BOOK-SIZE COMPUTERS, OPTICAL PUBLISHING AND OTHER INNOVATIONS. (SEE ATTACHMENT)

EUROPE PLANS TO REBUILD ITS ENTIRE BROADCASTING INFRASTRUCTURE AROUND ATV THROUGH A PROGRAM CALLED TELEVISION WITHOUT FRONTIERS THAT WILL CREATE A NEW, HIGH-DEFINITION, SATELLITE-BASED SYSTEM. ORGANIZATIONS APPLYING TO USE THE NEW SATELLITE CHANNELS MUST SIGN ON TO A PROGRAM THAT MOVES IN THREE STAGES TO A TRUE HIGH-DEFINITION SYSTEM BY 1992. HIGH-DEFINITION COVERAGE OF THE 1992 BARCELONA SUMMER OLYMPICS IS PLANNED AS THE KICK-OFF FOR HIGH-DEFINITION BROADCASTING IN EUROPE. THE EUROPEAN INDUSTRY, WITH GOVERNMENT SUPPORT, HAS SPENT SEVERAL HUNDRED MILLION DOLLARS ON DEVELOPMENT OF THE EUROPEAN HIGH-DEFINITION TECHNOLOGY (MAC) THROUGH A SUBGROUP OF THE EUREKA ORGANIZATION.

THE U.S. IS SIGNIFICANTLY BEHIND JAPAN AND EUROPE IN THE QUALITY OF ITS INFRASTRUCTURE. SUCCESS IN CONSUMER ELECTRONICS IS DRIVEN BY RAPID AND INNOVATIVE DESIGN CAPABILITIES; FLEXIBLE, HIGH-QUALITY, AND LOW-COST PLANTS; AND TIGHT, CLOSE LINKS BETWEEN THESE TWO. HISTORICALLY, U.S.-BASED COMPANIES HAVE BEEN LESS SUCCESSFUL THAN OBSERVED JAPANESE AND EUROPEAN COMPANIES IN MAKING THESE ELEMENTS OF THE INFRASTRUCTURE WORK. SIMPLY BEING FIRST WITH A TECHNOLOGICAL INNOVATION DOESN'T PROVIDE MUCH SUSTAINED BENEFIT; MANY FIRMS, NOTABLY THE JAPANESE, HAVE BEEN MUCH MORE ADEPT THAN U.S. COMPETITORS AT COST-EFFECTIVELY SPREADING AN INNOVATION RAPIDLY AND WIDELY INTO THEIR PRODUCT LINE.) THEY ARE AIDED BY EXTREMELY LOW-COST CAPITAL AND THE ABILITY TO SUSTAIN LOW PROFITS FOR MANY YEARS.

GAPS IN U.S. INFRASTRUCTURE

AGAINST THESE FUNDAMENTAL AREAS OF INFRASTRUCTURE WEAKNESS, SELECTED EFFORTS IN PRODUCT OR PROCESS R&D ARE UNABLE TO PRODUCE IMPROVEMENTS TO WORLD-CLASS LEVELS. ATV MAY WORSEN THE SITUATION, SINCE THE U.S. IS WEAK IN SOME KEY TECHNOLOGIES SUCH AS HIGH-RESOLUTION CRTs (CATHODE RAY TUBES), FLAT-PANEL DISPLAYS, AND RAM (RANDOM ACCESS MEMORY) PROCESS MANUFACTURING.

ENGINEERING AND MANUFACTURING HAVE BEEN THE ACHILLES' HEEL OF THE

ENGINEERING AND MANUFACTURING HAVE BEEN THE ACHILLES' HEEL OF THE U.S. CONSUMER ELECTRONICS INDUSTRY IN THE PAST. MAJOR STRENGTHS IN TECHNOLOGY AND MARKETING WERE NOT SUFFICIENT TO OFFSET THESE WEAKNESSES. IN THE NEXT ROUND, WITH EUROPEAN AND JAPANESE COMPANIES HAVING MADE MAJOR INVESTMENTS IN TECHNOLOGY DEVELOPMENT AND HAVING BUILT STRONG BRANDS IN THE U.S. MARKET, U.S. COMPETITORS WILL NEED TO BE FULLY COMPETITIVE IN THEIR ENGINEERING/MANUFACTURING INFRASTRUCTURE TO BE SUCCESSFUL.

THE U.S. INFRASTRUCTURE FOR VIDEO PRODUCTS IS CURRENTLY BEHIND THOSE OF JAPAN AND EUROPE. THE LEADING JAPANESE PRODUCERS HAVE SUPERIOR INFRASTRUCTURE ON SEVERAL DIMENSIONS:

o COMPREHENSIVE AUTOMATION (WHICH INCREASES BOTH PRODUCTIVITY AND PROCESS CONTROL)

o PROCESS CONTROL, WHICH IS KEY TO PRODUCTION OF LARGE, HIGH-RESOLUTION COLOR DISPLAYS (MOST OF WHICH ARE NOW MADE IN JAPAN), AND

o TIGHT LINKS BETWEEN ENGINEERING AND MANUFACTURING.

THE U.S. ALSO IS WEAK AT PRESENT IN TECHNOLOGY AND/OR MANUFACTURING INFRASTRUCTURE FOR SEVERAL COMPONENT CATEGORIES IMPORTANT TO ATV PRODUCTS IN ADDITION TO HIGH RESOLUTION CRTs, PARTICULARLY VCR HEADS, VIDEO RAMs, AND ANALOG SEMICONDUCTORS.

NIST AND ATV

THE AUTHORIZATION OF "SEED MONEY" FOR ADVANCED ELECTRONICS/ATV IN S. 1191 WOULD PROVIDE THE HELP INDUSTRY CRITICALLY NEEDS TO TACKLE THESE INFRASTRUCTURE DEFICIENCIES. IN PARTICULAR, NIST'S ADVANCED TECHNOLOGY PROGRAM IS IDEALLY SUITED TO SUPPORT INDUSTRY-LED EFFORTS IN ATV RESEARCH, TECHNOLOGY DEVELOPMENT AND TESTING, AND PROTOTYPE PRODUCT AND PRODUCTION PROCESSES DEVELOPMENT.

ADVANCED ELECTRONICS ADVISORY BOARD

AEA ALSO IS PLEASED THAT S. 1191 INCLUDES PROVISIONS ALLOWING THE DOC/NIST TO ORGANIZE AN "ADVANCED ELECTRONICS ADVISORY BOARD" FOR DEVELOPING A PLAN FOR RESEARCH AND DEVELOPMENT IN ADVANCED ELECTRONICS/ATV. THIS IS CERTAINLY A STEP IN THE RIGHT DIRECTION, AND AEA LOOKS FORWARD TO WORKING WITH THE COMMITTEE TO ENHANCE THE BOARD'S POSITION AND ROLE AND PROVIDE SPECIFICS AS TO ITS COMPOSITION AND AUTHORITY.

FOREIGN PARTICIPATION

AEA STRONGLY URGES THE COMMITTEE TO RECONSIDER THE BILL'S RESTRICTIONS ON PARTICIPATION BY, AND LICENSING ARRANGEMENTS WITH, FOREIGN COMPANIES AND THEIR SUBSIDIARIES.

U.S. COMPETITIVENESS IN THIS GLOBAL ECONOMY IN WHICH WE TRADE IT IS NOT POSSIBLE TO IGNORE THE EFFECTS THAT FOREIGN COMPANIES WILL HAVE ON OUR COMPETITIVE POSTURE. AFTER ALL, WE ACTIVELY COMPETE AGAINST FOREIGN COMPANIES BUT--IT MUST NOT BE FORGOTTEN--WE ALSO TRADE WITH MANY OF THOSE SAME COMPANIES. AND BEYOND TRADE, THEE IS A TRADITION OF COOPERATION BETWEEN MANY U.S. COMPANIES AND FOREIGN FIRMS, FOR EXAMPLE, IS A COMMON PRACTICE BUT IT IS A VITAL TOOL IN THE ABILITY OF U.S. COMPANIES TO MAINTAIN--AND IN MANY AREAS REGAIN--OUR COMPETITIVE STRENGTH.

TO THE EXTENT THAT S.1191 RESTRICTS SUCH LICENSING AND COMPLICATES ALREADY INTRICATE LICENSING NEGOTIATIONS AND EXISTING ARRANGEMENTS, THE LEGISLATION IS HARMFUL TO U.S. COMPETITIVE INTERESTS. FURTHER, THE BROADER RESTRICTIONS ON FOREIGN PARTICIPATION IN U.S. JOINT VENTURES ARE EQUALLY OMINOUS. LET ME EXPLAIN WHY.

THERE IS LITTLE QUESTION THAT ONCE IN OUR HISTORY, FOLLOWING WORLD WAR II, OUR COUNTRY'S SCIENTIFIC, ENGINEERING AND MANUFACTURING ABILITIES WERE DOMINANT. WE HAD MATERIALS AND TOOLS AND PROCESSES AND TECHNICAL KNOWLEDGE THAT WERE THE ENVY OF THE WORLD. AND THE WORLD SOUGHT THEM FROM US. WE HAD TO BE VERY CAREFUL NOT TO GIVE TOO MUCH AWAY AND THEREBY JEOPARDIZED OUR COMPETITIVE ADVANTAGE OR NATIONAL SECURITY. THOSE CONCERNS IN AREAS WHERE WE REMAIN DOMINANT, ARE STILL WITH US.

IN THE WORLD OF ELECTRONICS, THERE ARE MANY NEW TECHNOLOGIES THAT WILL BE VITAL TO OUR FUTURE COMPETITIVENESS--TECHNOLOGIES SUCH AS SUPERCONDUCTIVITY, X-RAY LITHOGRAPHY, FLAT PANEL TECHNOLOGIES AND MANY ENGINEERING AND MANUFACTURING PROCESSES CRITICAL TO THE CONSUMER ELECTRONICS BUSINESS, INCLUDING HDTV. WHILE THE U.S. IS PROGRESSING WELL IN SOME OF THESE AREAS, IT IS CLEAR THAT FOREIGN COMPANIES AND CONSORTIA HAVE A LEAD IN MANY OTHERS. TO THAT EXTENT, FOREIGN PARTICIPANTS CAN BE VALUABLE ALLIES IN OUR JOINT EFFORTS, PARTICULARLY IN THOSE AREAS WHERE WE ARE PARTICULARLY WEAK.

BENEFITING FROM FOREIGN PARTICIPATION

MANY OF THESE FOREIGN COMPANIES HAVE EXTENSIVE RESEARCH, DEVELOPMENT AND MANUFACTURING FACILITIES IN THE U.S., AND HAVE BEEN IN BUSINESS HERE FOR A HALF CENTURY OR LONGER. THEY HAVE MUCH TO BRING TO US, JUST AS U.S. BASED COMPANIES OPERATING IN FOREIGN COUNTRIES HAVE MUCH TO BRING TO FOREIGN JOINT VENTURES. BUT WHEN U.S. JOINT VENTURES, SUCH AS SEMATECH, EXCLUDE PARTICIPATION OF FOREIGN BASED FIRMS WHO HAVE EXTENSIVE U.S. RESEARCH, DEVELOPMENT AND MANUFACTURING FACILITIES--AND HAVE HAD SUCH FACILITIES IN THE U.S. FOR DECADES--IT COULD BE PREDICTED THAT THOSE FOREIGN FIRMS WOULD OBJECT TO THE PARTICIPATION OF U.S. BASED COMPANIES IN JOINT VENTURES ABROAD. FORMALIZATION OF SUCH EXCLUSION THROUGH LEGISLATION ONLY INCREASES POLARIZATION.

WE HAVE TWO CHOICES IN PURSUING NEW, CRITICAL TECHNOLOGIES. WE

THAT THOSE FOREIGN FIRMS WOULD OBJECT TO THE PARTICIPATION OF U.S. BASED COMPANIES IN JOINT VENTURES ABROAD. FORMALIZATION OF SUCH EXCLUSION THROUGH LEGISLATION ONLY INCREASES POLARIZATION.

WE HAVE TWO CHOICES IN PURSUING NEW, CRITICAL TECHNOLOGIES. WE CAN REINVENT THE WHEEL, REQUIRING AN INVESTMENT OF TIME AND MONEY THAT ULTIMATELY WILL BE SO GREAT THAT WE WILL BE UNABLE TO EFFECTIVELY COMPETE. ALTERNATIVELY, WE CAN WORK OUT MUTUALLY BENEFICIAL ARRANGEMENTS WITH FOREIGN COMPANIES--MANY OF WHOM ARE EXPRESSING INTEREST IN JOINT VENTURES WITH U.S. BASED COMPANIES IN AREAS WHERE WE NEED THEIR EXPERIENCE AND EXPERTISE--AND TOGETHER WE CAN DEVELOP AN INTEGRAL, COMPETITIVE ROLE FOR THE UNITED STATES IN FUTURE GENERATIONS OF ELECTRONICS PRODUCTS.

IN SUMMARIZING THESE POINTS, I AM NOT SUGGESTING PARTICIPATION OF FOREIGN BASED COMPANIES THAT HAVE NOT MADE MAJOR INVESTMENTS IN THE UNITED STATES OR THAT CAN ONLY BRING LUKEWARM BENEFITS TO A JOINT VENTURE. RATHER, I AM SUGGESTING THAT WHEN ANY COMPANY--REGARDLESS OF ITS NATIONAL ORIGIN--IS ABLE TO BRING SUCH SIGNIFICANT TECHNOLOGY AND SKILL TO A JOINT VENTURE THAT IT FUNDAMENTALLY ALTERS THE LEVEL OF SUCCESS THAT COULD OTHERWISE BE EXPECTED FROM THE PARTICIPANTS, AND WHEN THAT COMPANY HAS MAJOR RESEARCH, DEVELOPMENT AND MANUFACTURING FACILITIES IN OUR COUNTRY, WE WOULD BE SHORTSIGHTED AND EVEN ARROGANT NOT TO CONSIDER SUCH INVOLVEMENT ON ITS MERITS. THESE TYPES OF TECHNOLOGICAL JUDGEMENTS ARE ROUTINE FOR INDUSTRY. WE ARE GOOD AT THIS. BUT TO TIE THE HANDS OF JOINT VENTURE PARTICIPANTS BY PREEMPTING THEIR ABILITY TO BRING IN NEEDED PARTNERS AND TECHNOLOGIES, WHICH MAY EXIST ONLY IN FOREIGN BASED COMPANIES, STRIKES US AS COUNTERPRODUCTIVE.

LICENSING FOR U.S. BENEFIT

BUT AS SERIOUS AS THIS PROBLEM MAY BE, EQUALLY COUNTERPRODUCTIVE ARE RESTRICTIONS ON HOW THE INTELLECTUAL PROPERTY RESULTING FROM SUCH JOINT VENTURES CAN BE LICENSED. AS I MENTIONED EARLIER, CROSS-LICENSING OF INTELLECTUAL PROPERTY IS A COMMON PRACTICE AMONG COMPANIES WORLDWIDE. IN A JOINT VENTURE, NEGOTIATIONS ON INTELLECTUAL PROPERTY RIGHTS ARE FREQUENTLY COMPLEX AS EACH PARTICIPANT SEEKS TO PROTECT HIS INTERESTS. OFTEN, EXISTING INTELLECTUAL PROPERTY MUST BE BROUGHT INTO A JOINT VENTURE. THIS IS ONLY ONE LEVEL OF COMPLEXITY, FOR THOSE TECHNOLOGIES THAT MAY BE NEEDED IN A JOINT VENTURE MAY ALREADY BE CROSS-LICENSED, AND THE DISPOSITION OF RESULTING PROPERTY, PERHAPS BUILT ON THE BASIS OF SUCH CROSS-LICENSED TECHNOLOGY, BECOMES AN INTRICATE MATTER.

AGAIN, INDUSTRY IS ACCUSTOMED TO SUCH NEGOTIATIONS. WE ARE SKILLED AT BALANCING THE INTELLECTUAL PROPERTY CONTRIBUTIONS OF EACH PARTNER AND ARRIVING AT APPROPRIATE LICENSE FEES. BUT WHEN GOVERNMENT RESTRICTS WHO CAN RECEIVE A LICENSE AND SPECIFICS UNDER WHAT CONDITIONS THAT LICENSE CAN BE GRANTED, SUDDENLY INVOLVED PARTIES HAVE NO WAY TO DETERMINE HOW TO LICENSE, WHAT

HARMED OUR ABILITY TO WIN.

WE MUST GET AWAY FROM THE NOTION THAT ALLOWING FOREIGN PARTICIPANTS INTO JOINT VENTURES IN WHICH THE U.S. GOVERNMENT HAS INVESTED IS SOMEHOW GIVING AWAY MONEY TO THE ENEMY. I WOULD SUGGEST THAT IN THE GLOBAL ENVIRONMENT IN WHICH WE TRADE, THE TERM ENEMY IS RELATIVE, AND IN THE CASE OF FOREIGN PARTICIPANTS WHO ARE WILLING TO SHARE ADVANCED TECHNOLOGIES THAT WE NEED, WE ARE GIVING AWAY NOTHING. RATHER, WE ARE BUYING THAT TECHNOLOGY AND SKILL MANY TIMES CHEAPER THAN WE COULD RECREATE IT ALONE. IT IS IMPORTANT TO UNDERSTAND, HOWEVER, THAT FOREIGN PARTICIPATION CAN NOT BE A SUBSTITUE FOR U.S. GOVERNMENT/INDUSTRY PARTNERSHIP. ONLY WITH THE CONCERTED EFFORTS OF INDUSTRY AND OUR FEDERAL GOVERNMENT, WILL WE BE ABLE TO ESTABLISH A U.S.- BASED ATV INDUSTRY AND BUILD A STRONG U.S. TECHNOLOGY BASE.

WITH OUR COMPETITIVENESS AS THE OBJECTIVE, AEA URGES THE COMMITTEE TO RECONSIDER THE FOREIGN PARTICIPATION AND LICENSING PROVISIONS. AEA WOULD LIKE TO WORK WITH THE COMMITTEE TO DEVELOP ALTERNATIVE, CONSTRUCTIVE GUIDELINES FOR WORKING WITH FOREIGN COMPANIES, AND TO PROMOTE THE ENACTMENT OF WHAT IS A CRITICALLY NEEDED AND TIMELY LEGISLATION.

The CHAIRMAN. Thank you for a very, very good statement. We want to work with you.

I would like to comment on two matters. One, of course, is that most of the Committee's Members are now at other hearings. My own Appropriations Committee is now marking up three appropriations bills, to which I have given a proxy. The Finance Committee is meeting, as are several others, and they are marking their bills up so that we can vote on a few of them before we leave here next week. Then we will come back and complete all of our budget work and everything else before the beginning of the next budget year on October first.

So, as they say out on the farm, we are into the short rows. That is why you see a lot of the Senators have had to come and go. I thought the panel should understand that, because you have gone out of your way to appear here, for the interest of all of us here in the Congress, not just in this Committee, and we are grateful to you all. The lack of attendance of my colleagues now is because they are required to be at other Committees.

At any rate, our distinguished friend Secretary Murrin, is still in the audience. I wish the rules would allow me to let him cross examine you.

Secretary Murrin and others have commented on how we have studied the Japanese—what makes them tick and how they have become so productive.

I think there is a one word answer, and that is "hungry."

I will never forget, back in my own law practice at the very early stages, almost 40 years ago, I had a young, black lawyer come and want to associate with me just for the experience. I was trying a murder case. His name is Judge Richard Fields. He is now the judge in my home town of Charleston.

He went back to Wayne University for his college reunion after we got through the trial. He came back and I asked how are they doing now, Richard. He said well, they are not doing nearly as well as I am. I asked what the matter was. He said well, most of them in the class had

money and they were all interested in clothes, plays, and other things of that kind, but they are not really as happy as I am.

He said, you know, I'm hungry". He said, "My father had to make every nickel for my college education at the railroad station, shining shoes over the years, and I'm still hungry. They are not hungry up there."

Well, I thought of that with respect to my endeavor and others in our backyard. Governor Hodges and later Governor, now Senator Sanford, of North Carolina and I, we were hungry.

I went up to Chicago with Roger Blough to open up a new steel rolling mill which was electronically controlled. This was about 30 years ago.

There was a sparse crowd there in Chicago and they didn't seem to be much concerned. Why if we opened up a sewing plant with 100 employees in South Carolina, the governor, the lieutenant governor, the mayor, the whole blooming State turned out. That is because we are hungry.

Secretary Murrin, the Japanese are hungry. They are willing and ready to compete.

I can tell you categorically that change is taking place. The country is hungry and it is Washington that is sated.

I found that out four years ago in the presidential race. We will debate here in Congress about foreign investment and industry in this country. Why there is not a governor worth his salt that does not have a fund, some kind of endeavor, some kind of office in Brussels or Tokyo to bring in foreign industry. They are hungry.

Secretary Murrin and these four witnesses all come to the same conclusion: let's go. They are hungry. One says I don't care whether they are foreign or American or whatever it is, so long as they are participating and giving us the jobs, the opportunity, let's go with them. Let's not fuss around. We need jobs and we are hungry.

Another says that we need more money, but don't forget the original intent. Dr. McTague, I think you are right on target. We don't want, in trying to bring about this endeavor, to neglect NIST, the National Institute of Standards and Technology.

So, it is a big change that is going on up here in the Congress. I can see it. It is not protectionism. These writers don't know what they are writing about.

We are hungry. We are not going to start a war because the war has already been going on for 200 years, the trade war. The Europeans are positioning themselves even better with the EEC by 1992. We might have a break with that geisha girl in Japan.

She might have changed around the Japanese Government. We ought to send her a thank you note.

She might have changed that crowd so they will go to work on improving their standard of living, with better salaries, better housing, better transportation, to clean up the environment so that you can breathe in Tokyo. It might be that the geisha girl changed the whole Japanese system, where they will go not just for market share—which is dump-

ing. That is why I was willing to make the bet, Mr. Resor. We have been in this for 30 or 40 years now.

They will raise their standard of living and maybe they will not go so gung-ho for market share and will give us a chance, maybe indirectly, to rebuild here.

Yes, we took a lot of the industry from the North down to the South because we were hungry, and we still are. The rest of the country now has become hungry. Washington is what is sated.

Rather than palaver around, let's all work together.

It is a sort of sad commentary, really, Mr. Bahr, that we have to be very careful about how we word an American taxpayer financed program to make sure that the foreigner can participate because they have the resources, the research, the momentum and everything else going.

I don't know. Is it too late, Dr. McTague, for HDTV here, given the effect that it is so far ahead?

I will ask Mr. Resor, too, from the American Electronics Administration if he thinks it is too late?

Dr. McTAGUE. No, sir, I don't.

I think we have some very significant strengths in several areas of underlying technology. We have, unfortunately, lost one of the important points that you brought up, which was market share, which is related to long-term investment. But with some discipline and with taking the long-term approach, but keeping one's eye on the target, I have confidence in the capability of American industry and in the technical talent that we have in this country.

I think the important thing is to keep one's eye on the ball and not keep changing every six months to address a different crisis. We must keep our eye on the ball, like the Japanese have done.

The CHAIRMAN. Mr. Resor, what about it from the viewpoint of the American Electronics Association?

Mr. RESOR. There is no question that we are late, but I don't believe we are too late.

I heard Representative Levine answer this same question a couple of months ago, and he added a third point, which is, "What choice do we have?"

One of the things I did not really get into in my discussion is the concept of "Giant Electronics."

The technology that is being developed, particularly in flat panel displays—not so much in high resolution CRT's, but in flat panel displays—is very similar to the process that is used to make IC chips, integrated circuits and microprocessors.

The display that is passing around is just a giant memory chip. But, as human beings, we are not interested in displays the size of a postage stamp, even a commemorative stamp.

So the challenge is to build these circuits large.

I carry around with me a photograph of an 80 circuit chip board that has been replaced by a piece of glass that looks like a ruler. It is actually smaller than these nameplates (indicating). It contains the entire

circuit etched as a photographic pattern on the surface of that glass and replaces all the complexity of a printed circuit board.

It is not useful in very high speed applications, like the processor in a computer. But a television is not a really slow speed device, either. The bits are changing at about four megahertz. There is some paralleling.

So I see a lot of electronic products that are of commercial interest and military interest that are going to be fabricated by this technique.

The driver, the surprise is that the driver is the consumer segment.

I also think we have an opportunity to look at our computer industry, which is one of our strengths, and our communications industry. We may be able to focus through those channels some of the efforts.

As Secretary Murrin said, it is a very complicated subject and there are many opportunities. I like the idea of making some of this experimental. But we definitely need to get going on the technology while we work out the politics. I think the time is now.

I liked your story of the 25 foot rope for the drowning person who is 50 feet off the dock. It we don't make that preserver long enough, forget it.

The CHAIRMAN. Well, maybe Mr. Long will say that we are only 25 feet offshore. He says that we can do it all American-wise, that we don't have to allow the foreign entities to participate in this program.

What about it, Mr. Long?

Mr. LONG. Well, in my opinion, the real issue is the cost of capital.

We have interest rates in this country that are 11 percent-plus, and in Japan it is 4 percent-minus. If you consider the money that was given to these ten companies in Japan to develop superconducting materials, it is $800 million, and if you consider even a 50/50 participation with DARPA on one of these programs, it reduces our interest rate to maybe 6 percent, just on development. You know, this is almost like going to Las Vegas. If you go often enough, you know where you are going to end up.

The Japanese are going to have the manufacturing base in this country if we permit it. We have to do something about levelling that playing field because they have constructed their economy in such a way that it generates capital and limits consumer demand. Capital is cheap in Japan. We can even go to Japan and borrow a limited amount of money through a subsidiary that we have there for 4 percent. The reason we can do that is that the subsidiary cannot get that kind of return anywhere else in Japan. Four percent is a high interest rate for industrty in Japan.

We have to find a way to overcome that.

Now, it is obvious that there is not a free flow of capital beteween Japan and the United States otherwise the interest rate would be the same.

The CHAIRMAN. There is only one way to pay the bill. But you can't get this crowd to hear. I mean, they are all saying "Read my lips." That is going to keep the interest rate high.

Because of those interest rates, just the cost of the National Debt keeps growing—why it is jumping in increments of $25 billion next year. When Cpongress meets in January, whether we like it or not, we start new spending programs with a $25 billion increase in interest cost. The interest cost now exceeds the cost of Social Security.

It is the fastest growing item in the budget, and as long as we can get by with this charade and the American people continue to elect us, all we have to do is say "read our lips, don't pay the bill, let the interest costs go up." They think they are getting a free ride, which you indicated. I know that is exactly what the big difference is.

It could be the dumping, too, though. That is why, Mr. Bahr, you got where you are. Yes, allow them in if they produce the jobs, do the research, invest in the country and all. But you added certainly do not reward any who have been engaged in dumping.

Now, on one point, we brought a lot of those dumping cases to the Commerce Department but they haven't gone anywhere. We should be allowed to treat a dumping case the same way they do it in Europe and anywhere else. We give a distorted interpretation to dumping, whereby that related party on electronics, particularly, can bring that item in and we try to see whether it is a dumping violation, whether they are selling for less than what they would sell the product for in their home market.

We of course deduct the cost of insurance and freight. But then we allow that related party's promotional costs, his advertising, his salaries, and everything else, to be factored into the domestic price, and say you see, that is not less. In other words, we give them a 20 percent advantage over the domestic manufacturer by that interpretation of what we call the "exporter sales price offset." That is the technical terminology.

That 20 percent advantage allows them to take over market share. Then they can run the price up or whatever it is.

Right now, that is why you are having to testify, Mr. Bahr. They have the market.

So, we bring the Zenith case and we take it all the way through the courts and we win the decision. The Cabinet that is in the Cabinet room votes to sustain the court decision. But the President comes out of the Oval Office saying that I just talked with Nakasone and we are going to reverse that decision.

And so, Zenith says why fiddle faddle with lawyers in Washington and courts. I am going overseas. RCA has its largest factory down in Mexico.

By this kind of policy, we force them to go overseas. If you are a good businessman and you want to get ahead of the curve of competition, you just cannot come to South Carolina, New York, or California. You just cannot afford it.

To get ahead of the curve, you have to go to Taiwan or Mexico, and that is what has been happening.

And yet, we berate the industrialists as being lethargic. We have to get more competitive. We have to get off the golf course.

Dr. McTague you see the competition. They have financing, but you say for heaven's sake, don't have any loan guarantees. What about that? Do you want to elaborate on that?

Dr. McTAGUE. One of the points you made earlier, Senator, was the importance of being hungry.

I think a loan guarantee is a way to lull you to sleep. It lessens your own commitment and it seems to me that one of the great strengths of American industry is the risk taking that has historically made winners and losers, with the winners eventually rising to the top.

I do not think that government intervention in that process either has a particularly good track record or has promise for the future.

The CHAIRMAN. Well, SEMATECH and others, in computer chips we found it necessary. Mr. Long just testified that the cost of capital was the main problem. That is why loan guarantees were included, so the small entities or the consortia could participate.

We are trying to meet the competition, and any kind of technology—and there is a lot of it backed up there in that National Institute—is not going to be financed and is not going to be commercialized because of a lack of financing.

Dr. McTAGUE. I don't think the country is short of available venture capital. But let me comment on SEMATECH, which is an interesting case.

In SEMATECH, you have an interesting convergence of commercial interest with defense interest, where the Defense Department wishes to be a potential customer. So government intervention in that sort of area is rather different from government intervention in an area where you are mainly addressing commercial competitiveness.

I do not mean to establish a principle or to try to establish a principle, but there is a continuum of these goals related to purely commercial, to almost purely national security, and the criteria that you use in these cases are different.

But the private-venture capital type enterprises in this country I think have served us well. Requiring private risk taking I think is a very important activity.

I would hate to see American companies turn into nothing but research contractors for the government.

The CHAIRMAN. I would, too. But do we have a choice?

Mr. Resor, how can we compete with that $800 million program that the Japanese have for HDTV without some kind of government assistance?

Mr. RESOR. In my opinion, we won't. That is the simple answer.

I am not happy with that conclusion. I have wrestled with this myself for about a year and a half.

You are looking at a man who used to believe the best government was essentially no government. Well, I have come 180 degrees.

I agree with Clyde Prestowitz who says that we do have an industrial policy. The problem is that we have 40 or 50.

One of our industrial policies is that we expect private companies to compete with organized, national governments. We also have a tradition, I guess, more than a policy, that competition and cooperation are mutually exclusive.

I think we have found that neither of those positions is tenable any more. But we don't know how to let go of them.

That is not really the problem of this Committee. I think that is a problem that we have as a Nation.

I have done a lot of looking at the numbers in the television business and have talked with the Boston Consulting Group about this. Your figure of 20 percent is pretty close.

The actual receiver business runs on a profit margin of 2 percent, and though some of these issues that seem small, as I believe Senator Rockefeller said, the small issues often make the difference.

In the television business in particular, if we can swing the equation a few percent, it may change the ballgame.

I found I think there are really three issues in the business of television receiver manufacturing that are important. A company, to compete in HDTV, is going to have to set up a research effort, with fixed costs of I would guess between $25 and $50 million a year, including capital equipment and materials. That is the first part, the up-front capital.

There is also a factory, or two factories, to be built. Estimates for that factory range at between $50 and $100 million each.

So the first major hurdle is the up-front capital. I think that is the place to look for direct assistance.

The second problem is when we look at these investments as businessmen, we calculate the return and compare it to what we can get with putting the money in the bank.

GE went out of the television business with $4 billion to $6 billion in the bank. Digital Equipment just bought back $1.9 billion of its shares, instead of investing in this area.

I think there are plenty of other examples. I don't mean to focus just on those two companies.

So I think there is clear evidence that the cost of capital in this country is a big part of the problem. The AEA has supported the notion of low cost loans as a way to change that equation.

If people have a better idea, I know that the membership is receptive. The problem is the cost of capital. The suggested solution is the low cost loans.

Now there is a third problem, and that is that eventually these businesses have to make a profit.

I tried with my spreadsheet software to figure a way to run a television business and not make any profit. You might think I am stupid to even try. But that is the feeling I find among television executives, that is the reality they are facing into.

Believe me, there is no way to make a return at any rate for the cost of money without some profit down the road.

We have time to try to figure out how to fix that problem, and I think it centers very much on what advantage you give to domestic companies up front and what you do about dumping in the meantime.

The CHAIRMAN. Very good.

It is interesting because, as you can see, I come from the environment at the State level, where we have a Business Development Corporation to help in the financing.

I wish I were a governor again. I would have an airplane. There would not be a governor in the country that does not have a plane. The legislature would say get off your duff, get in the plane and go out and solicit industry.

We have planes, we have boards, we have training. If you have any one of those electronics industries looking for a place to locate, I will help them. We will pay for the training. We have Digital Electronics. Why 85 percent of the press boards of the Digital computers are made in Greenville, South Carolina, and we want more. Cincinnati Milacron is in South Carolina, but I want more.

We have not become "unhungry, unfat, unrich, and unhappy yet." And we pay for those things. Government is an active participant in the training and the financing. We'll dredge a river, we'll put in a water line, we'll put in a sewer line. And yet, I come up here to Washington and they say "get rid of the government." Just take care of Social Security, just take care of the COLAs, the cost of living, take care of the pay, pensions, and defense. But other than that, they say close government down. It is the enemy.

It is the problem and not the solution, they keep telling me.

Well, that is not true of the international competition, the international league in which we are trying to play and be a competitor. All of them are using their governments.

Yes, Mr. Bahr?

Mr. BAHR. Senator, if I just might comment from the point of view of the workers, for the past 15 years, or a little bit longer, we have seen our jobs go all over the world, in industry after industry.

At the present time, I am experiencing, along with AT&T, the shutdown of a facility in Winston-Salem of 3,500 workers. The feeling there is that nobody cares.

We look back at the breakup of AT&T, where in 1982, we had a $1 billion trade surplus in telecommunications. Last year, we approached a $3 billion deficit there. There is no planning. Nobody cared.

I think what is so terribly important about this hearing today and the introduction of your bill is that for the first time I believe we will set about emulating what is happening around the world. We are targeting an industry. We are deciding whether this is necessary for the benefit of our Nation.

If it is, whatever the problems are must be laid aside. We have here business, labor, and government working together to say that this is a targeted industry for the United States and whatever it takes to make it successful, that is what we have to do.

The CHAIRMAN. Well, I competed with Governor Hodges on Western Electric and Eastman. I won out on Eastman, but he won out, temporarily, at Durham, with the Western Electric Company making those telephones.

I came through Singapore not long ago, and that is where they are making them now. They are gone.

Mr. BAHR. There is an interesting sidenote that I would just make because things are changing.

Those very telephones that are made in Singapore were being sent back for repair to Singapore. They were being sent back. You could have purchased one in Radio Shack and brought it home, and Mrs. Hollings might say we can't afford this. So you brought it back. It never was out of the box. But it went back to Singapore.

We have now persuaded AT&T and have a trial project going in Atlanta, in a facility that might have shut, with 150,000 of those telephones coming in for repair. Based on our working together, the union and the management, with the technology that we have here, we are now beating the pants off Singapore.

The CHAIRMAN. Wonderful.

Mr. BAHR. So there are some successes happening.

The CHAIRMAN. Well, the Committee is indebted to each of you who came here this morning.

If there are no further comments, we will be in recess until the call of the Chair.

Thank you all very, very much.

[Whereupon, at 11:36 a.m., the Committee recessed, to reconvene upon the call of the Chair.]

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